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Physical activity is positively associated with physical self-worth and quality of life in older adults (McAuley et al., 2006), young adults (Joseph et al., 2014) and children and adolescents (Breslin et al., 2017; Ekeland, Heian, & Hagen, 2005). Previous research has further indicated that gender may play an essential role in the relationship between physical activity and physical self-worth (Babic et al., 2014). However, little is known about the underlying factors influencing the relationship between physical activity and quality of life in early adolescents. In this regard, the purpose of the present study was to examine if physical self-worth would mediate the association between physical activity and quality of life. Additionally, the moderating role of gender in the relationship between PA and physical self-worth and between physical self-worth and quality of life was explored. Data from 236 Korean middle school students (boys = 139, 58.9%; girls = 97, 41.1%; middle school first grade = 127, 53.8%; middle school third grade = 109, 46.2%) were used for the present study. The participants were asked to complete the PACE+ Adolescent Physical Activity Measure (Prochaska, Sallis, & Long, 2001), the Children and Youth Physical Self-Worth Scale (Whitehead, 1995), the KIDSCREEN-10 (Ravens-Sieberer et al., 2010), and selective subscales of the KIDSCREEN-52 (Ravens-Sieberer et al., 2005).Mediation and moderated mediation models were analyzed utilizing the Hayes' (2013) PROCESS Macro. Results showed that PA was associated with PSW, which in turn, was further associated with global quality of life and subdimensions of quality of life (e.g., physical, psychological, and emotion and moods quality of life). No

significant moderating effect of gender was found. That is, regardless of gender, more physical activity led to higher perceptions of physical self-worth thereby contributing to higher perceptions of quality of life. Implications and directions for future research and physical activity interventions were discussed.

PHYSICAL ACTIVITY AND QUALITY OF LIFE IN KOREAN ADOLESCENTS: THE MEDIATING ROLE OF PHYSICAL SELF-WORTH AND MODERATING ROLE OF GENDER

by

Eungwang Oh

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Approved by

_____
Committee Chair

To God, Dad, Mom, and Brother.
I love you all.

APPROVAL PAGE

This dissertation written by Eungwang Oh has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

Committee Chair _____
Diane L. Gill

Committee Members _____
Thomas J. Martinek

_____
Michael A. Hemphill

_____
Robert A. Henson

_____
Date of Acceptance by Committee

_____
Date of Final Oral Examination

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CHAPTER I

INTRODUCTION

A myriad of epidemiological evidence in addition to reports from federal governmental, professional and international organizations has demonstrated that both women and men lack regular physical activity (PA) across all age groups, around the world (Centers for Disease Control and Prevention [CDC], 2014; U.S. Department of Health and Human Services [USDHHS], 2008, 2010; World Health Organization [WHO], 2015). About 20% of children and adolescents do not achieve sufficient PA (Song, Carroll, & Fulton, 2013; Currie et al., 2012; WHO, 2015), while only 13.8% of Korean adolescents are physically active for the minimum of 60 minutes daily for more than five days a week (Korea CDC, 2017). Moreover, research has repeatedly indicated that PA levels in youth show a gradual decline with age throughout childhood and adolescence (CDC, 2014; Korea CDC, 2017; Pate, Long, & Heath, 1994; Telama & Yang, 2000; Tremblay et al., 2014). A high prevalence of physical inactivity and a trend of decreasing PA with age are viewed as a concern for public health (Caspersen, Pereira, & Curran, 2000; Sallis, Prochaska, & Taylor, 2000) and corresponding action to promote PA among young people is imperative (WHO, 2015).

Benefits of Physical Activity

Accumulating scientific evidence has demonstrated that a physically active lifestyle in the preteen and teen years is associated with immediate and subsequent health benefits across race and ethnicity (USDHHS, 2008). Physiological benefits gained from regular PA in youth have been well-documented; higher levels of PA during the school years have been related to lower cardiovascular and metabolic disease risk factors (Bar-Or & Rowland, 2004; USDHHS, 1996). Specifically, physiological benefits from PA in youth include lower blood pressure, body fatness, abdominal adiposity, and more favorable body composition, lipid profiles (e.g., higher levels of high-density lipoprotein [HDL] and lower levels of low-density lipoprotein [LDL]), bone mineral content and density, cardiorespiratory and muscular fitness, and muscular strength (Andersen et al. 2006; CDC, 2014; Janssen & LeBlanc, 2010; Kemper, 2000; Strong et al., 2005; USDHHS, 2008). Also, mental and psychosocial benefits acquired from regular PA have been recognized; such benefits involve improvements in cognitive function, anxiety and depressive symptoms, self-perceptions (e.g., self-esteem, self-efficacy, and self-image), perceived health status, academic achievement, and quality of life (Ekeland, Heian, Hagen, Abbott, & Nordheim, 2004; Hallal, Victora, Azevedo, & Wells, 2006; Sibley & Etnier, 2003; Strong et al., 2005; USDHHS, 2008).

Relationships among Physical Activity, Quality of Life and Physical Self-Worth

Quality of life (QoL) has increasingly gained significance for public health (Dalton, Schetzina, Pfortmiller, Slawson, & Frye, 2010; Rejeski & Mihalko, 2001;

USDHHS 2010; WHO, 2015). Most research on the relationship between PA and QoL involved older adults (Bize, Johnson, & Plotnikoff, 2007; Penedo & Dahn 2005; Rejeski, Brawley, & Shumaker, 1996; Rejeski & Mihalko, 2001), who typically have lower levels of PA and lower perceptions of physical health conditions, health status, and QoL than younger people (Hopman et al., 2000; Rejeski & Mihalko, 2001). It is well-accepted that PA provides beneficial effects on multiple aspects of QoL both in the clinical population and general population. Meta-analyses indicated that PA yielded small to modest, yet meaningful improvements in QoL (Gillison, Skevington, Sato, Standage, & Evangelidou, 2009; Netz, Wu, Becker, & Tenenbaum, 2005; Schechtman & Ory, 2001). Several reviews concluded that engaging in regular PA is positively associated with heightened QoL independent of individual characteristics such as age, initial health, and activity status (Bize et al., 2007; McAuley & Rudolph, 1995; Rejeski et al., 1996; Rejeski & Mihalko, 2001). In addition, meeting PA recommendation guidelines is positively associated with most dimensions of QoL (Blacklock, Rhodes, & Brown, 2007; Vuillemin et al., 2005). Gill et al. (2013) analyzed open-ended survey responses and focus group interviews and found that PA benefits reported by participants encompassed physical, emotional, social, and integrative aspects of QoL.

Despite the importance of promoting regular PA, psychological well-being and overall QoL across the lifespan, our knowledge about the association between PA and QoL during the adolescent years is in its infancy (Bize et al., 2007). Research interest in the relationship between PA and QoL in young people has substantially increased over the last decade (e.g., Gopinath, Hardy, Baur, Burlutsky, &Mitchell, 2012; Gu, Solmon, &

Zhang, 2014; Lacy et al., 2012; Shoup, Gattshall, Dandamudi, & Estabrooks, 2008). Most of the cross-sectional research to date supports a positive relationship between PA and QoL among children and adolescents (e.g., Iannotti, Kogan, Janssen, & Boyce, 2009; Paxton et al., 2010; Wu, Ohinmaa & Veugelers, 2011), with very few exceptions reporting the non-significant association between PA and QoL (Boyle et al., 2010; Morgan, Okely, Cliff, Jones, & Baur, 2008). Specifically, Iannotti and colleagues (2009a, 2009b) found that PA had positive association with global QoL and several indicators of positive health such as quality of social relationships and satisfaction with body image in healthy adolescents across various countries. In addition, Lacy et al. (2012) examined the association between PA and QoL among Australian adolescents and found that being physically active during and after school was positively related to higher QoL scores. Breslin and colleagues (2012, 2017) provided additional support for the positive association of PA to QoL among Irish children by reporting that children who achieved recommended PA levels showed higher scores on many aspects of QoL.

Experimental research investigated the effect of exercise programs on QoL in young people with health impairments. In their randomized controlled trial (RCT) of an exercise program with children, adolescents, and young adults with congenital heart or cardiac conditions, Dulfer et al. (2014) found that relative to the control group, children and early adolescents in the exercise condition experienced significant improvements in self-rated cognitive functioning and parent-rated social functioning whereas older adolescents and young adults in the exercise condition did not experience improvements in QoL. In a cross-over randomized trial in the hospital setting among youth with cancer,

Speyer, Herbinet, Vuillemin, Briançon, & Chastagner (2010) found that young participants in the adapted physical activity [APA] intervention had higher scores on most of the QoL dimensions, particularly psychological and physical dimensions.

Several studies in a cluster-randomized controlled trial examined the efficacy of PA programs on QoL in the school setting. In a study with underprivileged Australian adolescent girls (Casey et al., 2014), a collaborative school-community joint PA intervention program was associated with better physical, psychological and overall QoL. Another study investigating the efficacy of a school-based PA program among elementary students over one year (Hartmann, Zahner, Pühse, Puder, and Kriemler, 2010), revealed higher psychosocial QoL for first graders in the PA intervention program compared to those in the control group, but no improvements in fifth graders.

Despite the important implications of previous research for children and adolescents, it appears that the role that PA plays in enhancing QoL is rather complex. The varied measures, designs, and analyses make it difficult to establish firm conclusions about the role of PA in QoL in youth. McAuley and colleagues (Elavsky et al., 2005; McAuley & Elavsky, 2006; McAuley et al., 2006; McAuley et al., 2008) suggested that a clearer understanding of the PA-QoL relationship may be achieved by including potential mediating variables. Continued research investigating the underlying constructs on this complex relationship is necessary. Several reviews have indicated that PA may have both the direct and indirect effects on QoL (Bize et al., 2007; Gillison et al., 2009; McAuley & Morris, 2007; Netz et al., 2005; Rejeski & Mihalko, 2001).

A body of research indicates that the influence of PA on QoL may be mediated via pathways involving self-related variables such as self-worth and self-efficacy. Particularly, higher levels of PA are indirectly associated with improved QoL through higher physical self-worth (PSW), or physical self-esteem (Elavsky, 2009; Elavsky et al., 2005; Joseph, Royse, Benitez, & Pekmezi, 2014; Phillips et al., 2013; White, Wójcicki & McAuley, 2009). Longitudinal studies indicated that PA had long-term effects on global QoL indirectly through self-efficacy, PSW, or both (Elavsky, 2009; Elavsky et al., 2005; Phillips et al., 2013). In the most recent study with college students replicating the model proposed by Elavsky and colleagues (2005), Joseph et al. (2014) reported that PA was indirectly associated with QoL through PSW and affect. Importantly, PSW was the most salient mediator of all potential mediating factors and related to all of the factors. Taken together, the literature suggests that an examination of mediating factors underlying the PA-QoL relationship may shed light on how PA contributes to better QoL in youth.

Although several researchers revealed underlying factors associated with the relationship between PA and QoL in older adults, relatively few studies examined mediating variables among children and adolescents. Previous studies demonstrated the mediating effect of fitness on the association between PA and QoL (Gu, Chang, & Solmon, 2016) and of body dissatisfaction on the relationship between PA and QoL (Finne, Bucksch, Lampert & Kolip, 2013).Specifically, Finne et al. (2013) proposed that other potential mediating factors may provide additional explanations of the complex relationship between PA and QoL.

Potential moderating variables of the PA-QoL relationship have been suggested in the QoL literature. In particular, Rejeski and Mihalko (2001) emphasized the need for comprehensive research that includes both mediators and moderators to design effective PA programs. Although gender has been understudied as a moderator on the PA-QoL relationship, gender has been found to have considerable influence respectively on PA behaviors, QoL, general self-esteem and physical self-perceptions. Some research has shown that girls have lower QoL (Bisegger et al., 2005; Michel, Bisegger, Fuhr, & Abel, 2009; Swallen, Reither, Haas, & Meier, 2005) and lower levels of PA compared to boys (Caspersen et al., 2000; Korea CDC, 2017Sallis, Prochaska & Taylor, 2000; Song, Carroll, & Fulton, 2013). Gender differences in physical self-perceptions have consistently been reported. Specifically, compared to girls, boys typically had higher scores on nearly all constructs of physical self-perceptions (Asci, 2002; Hagger, Ashford, & Stambulova, 1998; Whitehead, 1995).

A few studies have identified gender as a moderator of the relationship between PA and self-perceptions. For example, Hayes, Crocker, and Kowalski (1999) found gender differences in physical self-perceptions and gender differences in the mediating effect of PSW. Haugen et al. (2011) examined moderating effects of gender on mediating variables on the relationship between PA and global self-worth. Their findings showed that gender moderated the pathways of body satisfaction and physical appearance attractiveness from PA to global self-worth. Specifically, there were stronger indirect effects of PA on global self-worth for female adolescents than for male adolescents. A recent meta-analytic review by Babic et al. (2014) found that gender moderated the

effects of PA on physical self-concept. The effect size was weaker for girls than for boys. Previous research clearly demonstrates the important role of gender on PA behaviors, self-perceptions and multiple aspects of QoL and warrants further research on gender as a moderator of the association between PA and QoL in adolescents.

Significance of Research on Physical Activity and Quality of Life in Korean Adolescents

It is well-known that adolescents experience a variety of physical, mental, psychological and behavioral changes during the early adolescent period (Erikson, 1968; Petersen, 1988; Wigfield et al., 1991). These considerable changes during early adolescence are associated with developmental challenges such as the beginning of puberty, social transition and identity development (Bisegger et al., 2005; Petersen, 1988), all of which influences adolescents' perceptions of QoL (Frisén, 2007). In addition, the structure, types and patterns of movement and activities change during late childhood and early adolescence (Strong et al., 2005). It has been consistently documented that not only regular PA participation (CDC, 2014; Korea CDC, 2017; Tremblay et al., 2014), but also overall QoL (Bisegger et al., 2005; Michel et al., 2009) progressively decline with age throughout the course of adolescence. Overall, adolescents are at risk of developing a physically inactive lifestyle and having low self-perceptions and QoL. Thus, it is critical to identify ways to prevent adolescents from decreases in PA and QoL. This requires a better understanding of the underlying factors influencing the association between PA and QoL in early adolescents.

Promotion of regular participation in PA and improvements in QoL aligns with primary objectives of international and national organizations (CDC, 2014; USDHHS, 2008; WHO, 1986).It should be noted that most of the studies investigating the PA and QoL association in children and adolescents have been conducted in North America or Europe. To date, only a few studies have examined the PA-QoL relationship among Asian children and adolescents (e.g., Chen, Sekine, Hamanishi, Yamagami & Kagamimori; Jalali-Farahani, Amiri, & Chin., 2016; Wafa et al., 2016), with no research on Korean adolescents. Hence, research on the relationship between PA and QoL in an Asian adolescent population is necessary given the different PA patterns and perceptions of QoL across cultural contexts (Kleinman, Eisenberg, & Good, 1978; Rees & Dinisman, 2015; WHO, 2015).

Notably, happiness in the school setting reported by Korean children was one of the lowest among OECD countries (Organization for Economic Co-operation and Development [OECD], 2013). Furthermore, global QoL of Korean adolescents was substantially lower than that of children and adolescents from other countries (Park & Huebner, 2005; Rees & Dinisman, 2015), which further warrants the need to enhance QoL in Korean youth. The current research is also in accord with Gill et al.'s (2013) suggestion that examination of the role of PA in QoL across different cultures is needed.

According to the current literature and documentation from national and international organizations, improving QoL is not an only essential objective for older adults, but also for children and adolescents. PA is recognized as a compelling and effective behavioral strategy to improve QoL (Biddle, Mutrie, & Gorely, 2015). Although

previous studies have shown a consistent relationship between PA and QoL, clearer explanation of the relation of PA to QoL in early adolescents is needed. Exploring simple correlations between PA and several domains of QoL may not offer in-depth understanding of how PA enhances QoL (Gillison et al., 2009).

Purpose and Proposed Models

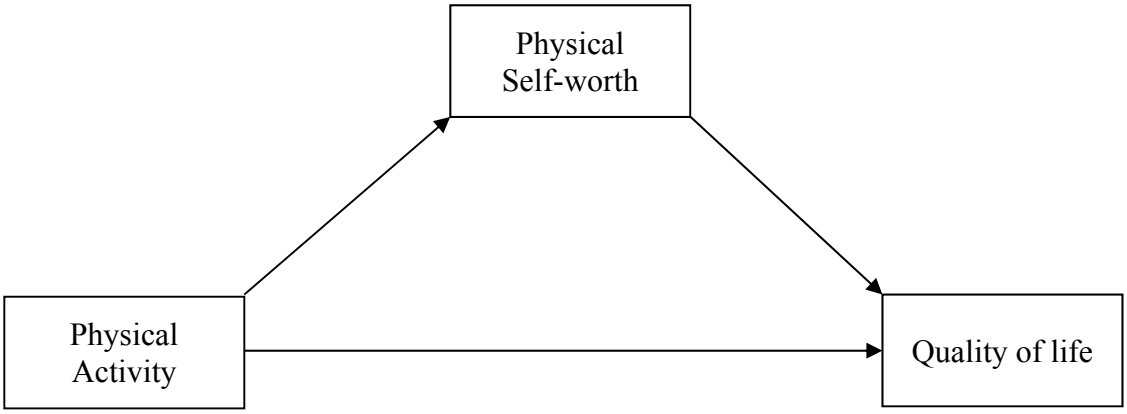
The main purpose of this study was to examine the relationships among PA, PSW and QoL with Korean early adolescents. In the hypothesized mediation model, it was predicted that PA would indirectly affect QoL through PSW. Specifically, it was hypothesized that PA would be directly associated with PSW, which in turn would be associated with global QoL and subdomains of QoL (e.g, physical, psychological, moods and emotions QoL). A conceptual model is shown in Figure 1. The secondary purpose of the present study was to examine the moderating role of gender on the pathways from PA to PSW and the path from PSW to QoL (see Figure 2). It was hypothesized that an indirect effect of PA on PSW would be relatively stronger for male adolescents than female adolescents. In addition, the role of gender on the path from PSW and QoL was explored. No specific hypothesis was made due to lack of available studies regarding the role of gender in this association. Finally, a conditional indirect effect of PA on QoL was explored.

This present study contributes to the literature by identifying mediating and moderating factors influencing PA and QoL in early adolescents. That is, the roles played

by PSW and gender in the relationship between PA and QoL may provide guidance for designing future research and PA programs to enhance QoL of early adolescents.

Figure 1

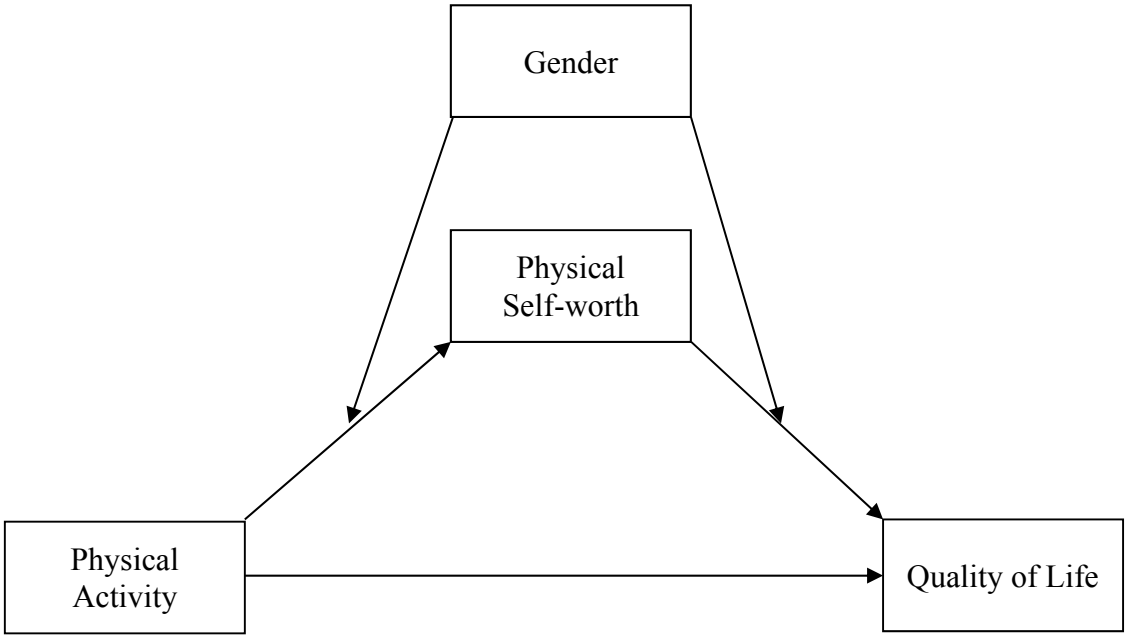
A Diagram of the Conceptual Mediation Model



Note: Four mediation models are tested with one quality of life variable as a dependent variable. Quality of life variables include global quality of life, physical quality of life, psychological quality of life, and emotions and moods quality of life.

Figure 2

A Diagram of the Conceptual Moderated Mediation Model



Note: Four moderated mediation models are tested with one quality of life variable as a dependent variable. Quality of life variables include global quality of life, physical quality of life, psychological quality of life, and emotions and moods quality of life.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this chapter is to provide an in-depth review of the current literature on the topic of this study - that is the relationships among physical activity (PA), quality of life (QoL), and physical self-worth (PSW). To begin with, existent research evidence linking PA and QoL indicators will be addressed. Then, an overview of a body of research on the PA and QoL relationship across different populations such as the clinical population, non-clinical population, and children and adolescents will be provided. Next, physical self-perception, physical self-worth, and self-esteem will be discussed in relation to PA. Following the overview of the current literature on variables of interest of this research, issues related to the measurement used for the present research will be discussed. Finally, a brief summary of this chapter and gaps identified in the current research will be addressed in addition to the objectives of the current study.

Key Terms

It is important to have a clear understanding of definitions of the variables in this current study because appropriate conceptualizations of variables are essential in research. The factors studied in research should be clearly defined in relation to the specific settings, methods, and measures (Goodwin, 2016). Lack of appropriate definitions of factors may not produce valid and meaningful results. Further, there are varying

definitions that exist in terms of physical activity (PA), quality of life (QoL), and physical self-worth (PSW), it may be necessary to provide cogent explanations of the definitions chosen in the current study over the other definitions. Hence, the definitions of the variables used in the current literature will be reviewed first. Then, definitions used in this study will be provided.

Physical Activity, Exercise, Leisure Time Physical Activity and Non-Leisure Time Physical Activity

The most often cited definition of PA is provided by Caspersen, Christenson, and Powell (1985). They described PA as "any bodily movement produced by skeletal muscles that results in energy expenditure." (p. 126). Another similar concept that has been often used interchangeably with PA is exercise (Caspersen et al., 1985). Even though Caspersen noted that PA and exercise are conceptually different, many studies do not often distinguish PA and exercise, which may generate inaccurate interpretation of the findings. PA is a broader term than exercise. Exercise is referred to as a purposeful PA behavior in a structured, repetitive format, accompanied by the goal to improve and maintain physical fitness and health (Caspersen et al., 1985).

PA was often categorized to subcategories such as PA practiced during household, leisure time, or transportation (USDHHS, 1996). Especially, the term, leisure time physical activity (LTPA) has been used frequently used in research; however, there are varied operational definitions of LTPA in the literature and researchers operationally

defined LTPA based on determinants of LTPA such as intensity, total metabolic equivalent of task (MET) and duration (Kerner & Kurrant, 2003).

LTPA is generally defined as PA practiced during any free time other than activities during housework, transportation, and work (Kandular & Lauderdale, 2005). According to USDHHS (1996), LTPA includes sports, recreational activities, and exercise training. In contrast, non-leisure time physical activity (NLTPA) refers to PA during housework, transportation, and work (Kandula & Lauderdale, 2005). LTPA has been measured frequently using the Godin-Shephard leisure time physical activity questionnaire, which classified PA into mild, moderate, and strenuous LTPA by intensity.

In this study, PA will be defined as "any activity that increases your heart rate and makes you get out of breath some of the time" (Prochaska et al., 2001, p. 558). This operation definition specifically refers to moderate to vigorous physical activity (MVPA), not restricted to LTPA. MVPA in this study includes playing time, transportation, leisure activities, and school PE classes. Using the PACE+ Adolescent Physical Activity Measure, days performed MVPA during the past week and a typical week will be calculated by summing up the days and used as PA scores.

Quality of Life and Health-Related Quality of Life

Previous research has conceptualized QoL differently and used different measures to assess QoL, which was a major hurdle to clearly understand the association between PA and QoL (Gill et al., 2011; Rejeski & Mihalko, 2001). Further, similar concepts of QoL have been used interchangeably in different contexts and populations (Karimi &

Brazier, 2016). Therefore, understanding distinction of definitions and measures used in the literature is critical. QoL has been described as a multidimensional construct, unidimensional construct, and a construct with a special focus on health.

In general, health-related quality of life (HRQoL) has been described as a part of QoL related to or affected by health (Torrance, 1987). It has been suggested that HRQoL was viewed as a construct that is greatly influenced by disease, injury and treatment of health conditions (Ebrahim, 1995; Ware & Sherbourne, 1992). Reviewing various definitions of HRQoL, O'Connor (2004) suggested that HRQoL generally reflects patients' subjective experience of overall health state. HRQoL has been interchangeably used with health, health state and health status (Post, 2014). Another view of HRQoL is a multidimensional construct comprising physical, mental, emotional, and social dimensions (USDHHS, 2010). One of the most widely used measures for HRQoL is the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) developed by Ware and colleagues (Ware & Shebourne, 1992; Ware, Kosinski, & Keller, 1994). It is important to note that most HRQoL measures are developed primarily for a clinical population and thus using this measure for a general population may be indefensible.

QoL has also been conceptualized as a unidimensional construct. Satisfaction with life conceptualized by Diener (1984) has often been used as a global construct of QoL in the literature (McAuley et al., 2008; Elavsky et al., 2005). Specifically, satisfaction with life was described as a subjective evaluation of satisfaction with overall life (Diener, 1984). Some researchers advocated for its use as a psychological construct (McAuley & Morris, 2007; Rejeski & Mihalko 2001). It should be noted that this global

construct is conceptually similar to integrative QoL from the conceptual model of QoL (Gill et al., 2011) and a global measure of QoL from the KIDSCREEN-10 developed for youth (Ravens-Sieberer et al. 2010).

A multidimensional perspective was adopted to offer a fuller description of QoL. One of the mostly cited QoL definitions is from World Health Organization Quality of Life Group (WHOQoL Group, 1993). QoL was illustrated as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, and their relationship to salient features of their environment" (World Health Organization Quality of Life Group, 1993, p.153). Similarly, Gill et al. defined QoL as "a subjective, multidimensional, integrative construct that reflects optimal well-being and positive health" (p. 184) and established a multidimensional model of QoL. Both of the definitions endorse multidimensionality of QoL and provide a more complete picture of the nature of QoL. Accordingly, measures that assess multidimensions of QoL were developed (e.g., the Gill QoL survey, 2011; WHOQoL survey, 1993; the KIDSCREEN surveys, 2006).

Importantly, Karimi and Brazier (2016) argued that HRQoL is an ambiguous concept that is not noticeably different from health state or QoL. They even further claimed that using the term QoL for the HRQoL measures that in reality assess health status is untenable. In addition, QoL is a more comprehensive and inclusive concept than HRQoL (Torrance, 1987) and therefore using the term, QoL should be more appropriate

when examining QoL in people without chronic conditions. The working definition of Gill et al. and the WHOQoL Group will be used in this study. Although the KIDSCREEN instruments are considered to measure HRQoL, the author believed that it is conceptually not different from QoL. Therefore, the term QoL will be used throughout this study.

Self-Perceptions, Self-Concept, Self-Worth and Physical Self-Worth

Understanding definitions of self-perceptions are particularly important because some constructs are conceptually similar and thus it can be confusing without being familiar with nuanced differences of the meanings. To make matters worse, coming across terms being used interchangeably is not uncommon in the literature (Horn, 2004).

To begin with, self-perceptions refer to "individuals' beliefs, perceptions, attitudes, thoughts, and feelings about themselves in general or about their abilities, skills, competencies, characteristics, and behaviors" (Horn, 2004, p. 102). Horn (2004) listed several specific terms related to overall self-perceptions as follows: self-concept, self-esteem, self-worth, self-efficacy and more.

Marsh and Shavelson (1985) broadly defined self-concept as a person's perceptions of oneself. More specifically, they noted that self-concept is a multifaceted, hierarchical, and dynamic concept. Global self-concept is viewed as a stable construct whereas distal subconstructs of self-concept are subject to change. Horn (2004) stated that self-concept underscores the descriptive part of the self while self-esteem (self-worth) focuses on the evaluative or judgmental aspect of the self. Self-esteem can be defined as

an individual's perception of self-worth (Rosenberg, 1965). However, it has been argued that a clear-cut distinction between self-concept and self-esteem is largely challenging (Harter, 1999). Moreover, researchers have used similar terms to describe global self-perceptions such as self-esteem, self-worth, and self-concept (Horn, 2004). Thus, it may be desirable to separate self-perceptions to global self-concept vs. domain-specific self-concepts based on a multidimensional, hierarchical model.

A multifaceted, hierarchical model of general self-concept has been proposed by Shavelson, Hubner, and Stanton (1976). In the model, global self-concept is at the top and domain-specific self-concepts such as social, emotional, and physical self-concept are located at the next level. Particularly, Fox and Corbin (1989) established a model of physical self-worth (PSW), which is one of the major variables in this study. PSW has four subdomains such as sport competence, body attractiveness, physical strength, and physical conditioning. In this regard, PSW is sometimes referred to as general or global PSW like self-worth is referred to as global self-worth. PSW has also been interchangeably used with physical self-esteem, physical self-concept, and physical self-perceptions (e.g., Babic et al., 2014; McDonald & Hodgdon, 1991). PSW can be described as an individual's perception of one's physical self (Fox, 1990). Further, PSW represents general feelings of happiness, satisfaction, pride, respect, and confidence in the physical self (Fox, 1990, p.6). Global PSW can be measured by the Physical Self-Perception Profile (PSPP) developed by Fox and Corbin (1989) or the Physical Self-Description Questionnaire (PSDQ) developed by Marsh, Richards, Johnson, Roche, and Tremayne (1994). In the current study, PSW will be measured by the PSPP.

Relationship between Physical Activity and Quality of Life Indicators

A substantial body of research exists that has documented positive links between regular physical activity (PA) and multiple aspects or overall quality of life (QoL). The beneficial role that PA plays in improving QoL has become a popular research topic across various disciplines including, but not limited to epidemiology, medicine, nursing, gerontology, psychology, and kinesiology. Several reviews examining the association of PA and QoL have consistently noted that when individuals participate in regular PA, they are likely to have enhanced QoL across different personal profiles such as age, health history, and activity status (McAuley & Rudolph, 1995; Rejeski et al., 1996; Rejeski & Mihalko, 2001). Particularly, in a recent symposium of the world congress of sport and exercise psychology, Gill (2017) argued that a higher level of PA contributes to higher QoL across cultures and called for continued efforts to examine the role of PA in QoL in different cultural contexts.

As noted by McAuley and Morris (2007), most of the earlier PA and QoL studies primarily focused on various indicators of mental health, psychological well-being, or QoL. Mental and psychosocial benefits resulting from PA include better health status, cognitive abilities, mood states, self-concept, self-esteem, and self-efficacy and lower anxiety, depression, and stress (Arent, Landers, & Etnier, 2000; Ekeland et al., 2004; Penedo & Dahn, 2005; USDHHS, 2008).

In an experimental study testing the effects of aerobic exercise on the perception of depression, McCann and Holmes (1984) found a reduction in depression in the exercise group in comparison to the relaxation or no treatment group. Moses, Steptoe,

Mathews, and Edwards (1989) investigated the effects of aerobic exercise training on various psychological outcomes such as mood states, coping ability, and physical well-being. They reported decreased levels of tension/anxiety and confusion after exercise training and coping deficits at a three-month follow-up in participants in the moderate intensity exercise group compared to the high-intensity exercise group or attention-placebo group. Other researchers have found that women with depression in both of the running and weightlifting conditions equally had the alleviation of depression (Doyne et al., 1987). Byrne and Byrne (1993) reviewed the studies examining the effects of exercise treatments on reduction in depressive symptoms, anxiety levels, and mood disorders and found that exercise provided beneficial effects on mood states as well as depression and anxiety symptoms. They further concluded that exercise has positive psychological benefits for both clinical and non-clinical populations.

Some studies utilized a large epidemiologic data. Using four different national survey datasets from the U.S. and Canada, Stephens (1988) analyzed the association between leisure-time physical activity (LTPA) and several mental health-related variables such as general well-being, feeling states, positive and negative affect, anxiety, and depression. Stephens concluded that positive associations between LTPA and nearly all aspects of mental health appeared across age and gender. King et al. (1993) investigated both physiological and psychological effects of the exercise program across the 1-year period. The results of their study revealed that participants across different exercise conditions reported greater improvements in physical and mental health, as compared to those in the control group. Blumenthal and colleagues (Blumenthal et al., 1999;

Blumenthal et al., 2007) have indicated beneficial effects of exercise for patients with depressive disorder. Some researchers (Babyak et al., 2000; Yaffe, 1981) have further suggested the applicability of exercise as a preventive method to alleviate negative psychological symptoms such as depression or mood disturbance. As can be seen in earlier studies, the positive effects of exercise on multiple aspects of mental health and psychological well-being have been documented.

Relationship between Physical Activity and Quality of Life in Adults

Evidence in a Clinical Population

Considerable research on the association between PA and QoL has been conducted, using populations of older adults with various chronic medical condition and health problems (Bize et al. 2007; Joos et al., 2004; Rejeski & Mihalko, 2001) including different types of cancers, cardiovascular diseases, central nervous system and joint symptoms such as osteoporosis and arthritis, and physical disabilities. Exercise regimens or rehabilitation training tailored to the specific needs of people with certain chronic diseases has been generally recommended (Pedersen & Saltin, 2006). In their review, Pedersen and Saltin assigned the degree of evidence from no evidence, limited evidence, moderate evidence, to strong evidence for a positive effect of exercise and physical activity training on outcome variables such as QoL. They assigned moderate to strong evidence of positive effects of exercise on QoL in the following chronic diseases: metabolic syndrome-related disorders, type 2 diabetes, dyslipidemia, hypertension, obesity, chronic obstructive pulmonary disease, coronary heart disease, chronic heart

failure, intermittent claudication, osteoarthritis, rheumatoid arthritis, osteoporosis, fibromyalgia, cancer, depression, and asthma. The only two exceptions that had limited evidence of exercise effects were type 1 diabetes (no evidence) and chronic fatigue syndrome (limited evidence).

An examination of the role of PA in QoL for people with different clinical conditions may be helpful in understanding the relationship in more detail. QoL for people with cardiopulmonary diseases has been observed in relation to exercise rehabilitation or exercise training interventions. For instance, a randomized control trial conducted by Emery, Schein, Hauck, and MacIntyre (1998) examined the effect of group conditions on physiological, psychological, and cognitive outcomes among patients with chronic obstructive pulmonary disease. Their study revealed that patients in the exercise and education group exhibited improvements in psychological well-being and physical functioning relative to patients in the education group alone. Another randomized control trial of exercise intervention on QoL in patients with chronic heart failure demonstrated significant differences in general well-being and feeling of being disabled between the exercise group and control group (Wielenga et al., 1998).

In their review of the studies that tested the effects of exercise on QoL among cancer patients and survivors, Courneya and Friedenreich (1999) reported a positive association of exercise training and improvements in many aspects of QoL outcomes such as physical, functional, psychological benefits. McNeely et al. (2006) conducted a meta-analysis on the effects of exercise interventions in breast cancer patients and survivors. The results of their review revealed exercise interventions led to an enhanced

physical functioning and cancer-specific QoL. One randomized controlled clinical trial conducted by Mustian et al. (2004) used breast cancer patients and survivors to examine the effectiveness of Tai Chi Chuan on QoL. It was found that breast cancer survivors in the Tai Chi Chuan improved QoL and self-esteem, whereas those in the psychosocial support group showed decreased QoL and self-esteem over the 12-week period.

There has been increasing research interest in the relationship between PA and QoL in individuals with multiple sclerosis (MS). Petajan et al. (1996) examined the effectiveness of aerobic exercise intervention on both fitness and quality of life among individuals with MS and concluded that the aerobic exercise intervention led to better physiological profiles and increased QoL components such as reduced anxiety and anger and higher social and emotional factors. In their meta-analytic review, Motl and Gosney (2008) supported the notion that exercise interventions lead to improvements in QoL in people with MS, by finding a small but positive effect size. Furthermore, investigating the pathways from self-reported PA to MS-related QoL in people with MS, Motl, McAuley, Snook and Gliottoni (2009) found that higher levels of PA are indirectly associated with better scores of MS-related QoL through higher levels of various mediators such as depression, disability, fatigue severity, anxiety, pain, social support, and MS-related self-efficacy. A recent study in individuals with MS provided further support for the positive effects of PA on people with MS such as a positive sense of overall life (Fasczewski, Gill, & Rothberger, 2017).

The PA-QoL relationship has been examined in people with physical difficulties and with joint problems such as osteoporosis and osteoarthritis. Stevens, Caputo, Fuller,

and Morgan (2008) evaluated the association between self-reported PA for people with physical disabilities and interview-based QoL scores and found that levels of PA significantly predicted QoL. Their findings are further supported by Giacobbi, Stancil, Hardin, and Bryant (2008) who reported enhanced QoL in active people with physical disabilities. The association between PA and QoL was examined for those with arthritis or chronic joint problems. Abell, Hootman, Zack, Moriarty and Helmick (2005) reported less unhealthy days within a month and better physical and mental HRQoL for people with arthritis who met recommended PA guidelines. Their findings suggested dose-response patterns of PA on QoL. An RCT of the home-based and group-based exercise for older women with osteoporosis demonstrated enhanced well-being and symptoms (Bravo et al., 1996). Another RCT of exercise training for individuals with osteoarthritis showed significant differences in HRQoL related to physical function between the exercise group and the control group (Dias, Dias & Ramos., 2003).

Clearly, psychological outcomes and global QoL have been positively associated with participation in exercise training in people with chronic conditions and health problems. It can be concluded that people with clinical conditions may experience multiple aspects of enhanced QoL when they engage in regular PA or exercise.

Evidence in a General Population

The relation of PA and QoL has been studied in both clinical and general populations. It has been suggested that the degree of which PA affects QoL may be different for healthy and unhealthy populations (Bize et al., 2007), which substantiates

the need to examine the PA-QoL relationship in individuals without major health problems. The literature on PA and QoL has primarily focused on advanced middle age and older age groups (Rejeski & Mihalko, 2001). A popularity of the research topic of the PA and QoL relationship in this specific population is justified by the increasing proportion of this population in the U.S. (McAuley & Morris, 2007). In addition, older adults are vulnerable to decreased perception of health status, functionality, independent living, and chronic health problems, which altogether is thought to result in substantial reduction in overall QoL (McAuley & Morris, 2007). Further, older adults have a less active lifestyle than younger adults (Haskell et al., 2007) and have lower physical health status than younger adults (Hopman et al., 2000). There has been evidence to indicate that older adults reported poorer QoL and mental health outcomes relative to younger adults (Brown et al., 2004; Vuillemin et al., 2005). Furthermore, it is well-known that only about one-third of the older adult population engage in regular PA (CDC, 2014). Hence, maintaining and enhancing both PA and QoL in the later years of life should be highlighted as one of the important public health objectives (Rejeski et al., 1996). This public health approach is also in line with the motto of the Gerontological Society of America that focused on adding quality to life, but not quantity to life (Rejeski & Mihalko, 2001).

A number of studies with varied research designs and instruments have been conducted to determine if PA significantly contributes to improvements in QoL even among healthy individuals. Therefore, it is important to review the current literature based on research designs. Observational studies examined the association between total

PA levels and several aspects of QoL. Brown and colleagues (Brown et al., 2003; Brown et al., 2004) used national surveillance data (Behavioral Risk Factor Surveillance System [BRFSS]) to investigate the association between meeting the recommended PA guidelines with HRQoL and health status. The national representative data revealed significant differences in QoL across groups classified by moderate to vigorous physical activity (MVPA) levels after controlling for demographic characteristics such as age, race/ethnicity, gender, education level, smoking record, and weight status. Specifically, relative to active people, those who are inactive or not sufficiently active for health benefits reported a higher prevalence of 14 or more unhealthy days in the past 30 days, which is indicative of impaired QoL.

Wendel-Vos, Schuit, Tijhuis, & Kromhout (2004) examined cross-sectional differences in QoL scores across five quintiles stratified by MVPA at the baseline and five-year follow-up. Cross-sectional data for both baseline and follow-up revealed significant differences in QoL scores by MVPA-based quintiles for both genders. Specifically, cross-sectional differences related to general health and physical aspects of QoL. They further found significant longitudinal associations between MVPA levels and social aspects of QoL for both genders, independent of the intensity of MVPA. It should be noted that there were slightly different trends of the cross-sectional and longitudinal association across MVPA quintiles between men and women. Using a large representative sample of older Australian women, Lee and Russell (2003) examined both cross-sectional and longitudinal associations between PA levels and QoL. They found that PA was positively linked to all dimensions of QoL cross-sectionally and most of the

dimensions of QoL longitudinally after controlling for confounding variables. Gill and colleagues (Gill et al., 2006) reviewed studies that examined the association between PA and QoL and concluded that the literature clearly demonstrates that QoL does not only motivate people to do PA, but also is benefits that can be obtained from doing PA (Gill et al., 2011).

There have been a few studies that demonstrated no or little efficacy of exercise intervention programs for better QoL dimensions. Ashley, Lloyd, Lamb, and Bartlett (2001) conducted a double-blind RCT of exercise promotion program to determine the effectiveness of the program on QoL. Although this structured exercise promotion program helped sedentary people to adopt a more active lifestyle, no statistically significant effect of the intervention on improvements in QoL was achieved. Similar findings were found in a quasi-experimental study by Ornes, Ransdell, Robertson, Trunnell, and Moyer-Mileur (2005) that tested the effect of exercise intervention on satisfaction with life. Although the home-based exercise group increased PA levels relative to the control group, no difference in satisfaction with life was found at the function of the exercise intervention. Also, no longitudinal change was reported. Brox and Frøystein (2005) found similar research evidence;an RCT of mixed exercise training (e.g., mild aerobic and strength exercise and stretching) brought about significant improvements in QoL or reduction in sickness absence in comparison to the control group.

In contrast, many studies showed favorable effects of physical exercise intervention programs on QoL. For instance, Brand, Schlicht, Grossmann, and Duhnsen

(2005) conducted an RCT of workplace-based exercise. Positive training effects were observed for overall QoL, psychological and physical aspects of QoL. More importantly, those who maintained regular PA kept enhanced QoL whereas those who relapsed from PA had reduced QoL when QoL was examined at the 13-week follow-up. A 24-week exercise intervention study demonstrated the positive effects acquired from participating in the mixed exercise training (Atlantis, Chow, Kirby, & Singh, 2004). Specifically, significant improvements in QoL, depression, and stress symptoms were found in the exercise group relative to the control group. Li et al. (2001) used Tai Chi for the exercise intervention and examined the effect of the Tai Chi exercise program on various aspects of QoL. Significant differences were found in all QoL dimensions between the Tai Chi exercise and control group. That is, participants in the Tai Chi exercise group over the 6-month period of time showed enhanced perceptions of general health and QoL.

Despite a limited body of qualitative research that explored the relation of PA to QoL, the findings are consistent with the results of observational and experimental studies. Stathi, Fox, and Mckenna (2002) conducted qualitative research in older adults who have physically active lifestyles to identify the aspects of QoL affected by their PA behaviors. Using the cross-case analytic technique, they revealed that PA enhances several aspects of QoL such as developmental, physical, mental, and social well-being, with an exception of material well-being which was reported to be not relevant for PA. Active older adults were clearly aware of the various advantages they can gain from participating in PA. Stathi et al. (2003) further indicated that their benefits for various aspects of QoL are likely to serve as a motivator for continued PA participation.

A recent qualitative study by Gill et al. (2013) found similar results. By collecting open-ended responses and focus group interview data from college students and community residents, they found that participants perceive the role of PA in multiple dimensions of QoL; social and emotional benefits were cited as many times as physical benefits by participants. Although physical, social, and emotional aspects of QoL emerged as the most salient benefits in relation to PA, other domains of QoL such as cognitive and spiritual benefits were often mentioned. Particularly, open-ended survey findings showed that participants may have more nuanced perspectives on the role of PA under the same dimension of QoL, depending on age. That is, community residents reported physical functioning, strength, and flexibility, whereas college students had more responses for staying in good physical shape within the same physical category.

Kim and colleagues (Kim et al., 2014, 2015) identified PA benefits in Korean immigrants. Using a constructive grounded theory methodology, they found that Korean immigrants who participate in various types of PA or sports within the Korean community reported improvements in psychological well-being. Notably, participants who participate in PA with the same ethnic members reported that they have a sense of cultural and social connections (Kim et al., 2014). Kim et al. (2015) suggested that such improvements in various aspects of well-being by engaging in regular PA may lead to better QoL later in life.

Brown and colleagues (2004) examined dose-response relationships between PA and QoL. Their findings showed a non-linear pattern of PA on QoL. That is, curvilinear relationships were evident between the frequency of PA and prevalence of 14 or more

unhealthy days and between duration of PA and prevalence of 14 or more unhealthy days. Specifically, physically active people for one to six days a week had better QoL compared to physically inactive people or physically active people for seven days a week. Also, people who are active for an adequate amount of time (less than 20 minutes a day) had better QoL than others who are inactive or who are active more than adequate (more than 90 minutes a day). A recent study using epidemiological data from Australian mid- to old-aged women examined both cross-sectional and longitudinal dose-response relationships between a total amount of PA and walking with QoL (Heesch, Van Uffelen, Van Gellecum & Brown, 2012). Seven categories were created based on a total amount of PA, ranging from none to very high. They analyzed coefficients for each category and found curvilinear associations between PA and walking with QoL scores from cross-sectional data. Specifically, coefficients were larger for a greater amount of PA and walking levels. Such trends were especially apparent in physical functioning, but less evident in mental health. Longitudinal data revealed relatively weaker dose-response associations.

There are several studies that indicate dose-response effects of PA on QoL or components that are closely related to QoL such as activities of daily living (ADL). Reuben, Laliberte, Hiris, and Mor (1990) examined if there was a gradient trend between groups classified by PA levels and advanced ADL. They found that PA levels had positive associations with greater gains of advanced ADL, health status and mental health in a gradient fashion. Similar patterns were observed between PA levels and QoL in the Japanese population (Morimoto et al., 2006). Specifically, Morimoto et al. reported

statistically significant dose-response relationships between PA levels and all aspects of QoL for both genders, after adjusting for covariates such as age, weight status, alcohol consumption, tobacco use, and medical history. Some studies have demonstrated the positive associations between meeting recommendation levels of PA and most of QoL dimensions (Blacklock, Rhodes, & Brown, 2007; Vuillemin et al., 2005). Specifically, Blacklock et al. (2007) found positive associations between PA and walking with QoL as reflected by general health, vitality, and social functioning after adjusting for demographic variables. They further suggested that more PA may provide additional benefits for general health. Vuillemin et al. (2005) found significant associations between LTPA and nearly all aspects of QoL for both men and women even after adjustments for individual characteristics. Notably, different QoL scores were found across groups stratified by the intensity of LTPA. That is, participants who have the higher intensity of PA reported better QoL relative to those categorized by inactive, irregular, or moderate intensity groups.

Although several studies aimed to determine dose-response relationships between PA and multiple indicators of QoL, the findings have been inconclusive. Some reviews indicated limited support for dose-response relationships between PA and QoL (Bize et al., 2007; McAuley & Morris, 2007), whereas other reviews found no definitive dose-response effects of PA on QoL (Netz et al., 2005; Spirduso & Cronin, 2001). In general, most reviews pointed out that further research is warranted to determine the dose-response relationships between PA and QoL. However, it is important to note that

although the evidence on the dose-response relationship is only partially supported, an overwhelming number of studies have demonstrated favorable effects of PA on QoL.

There have been several attempts to systematically document the association between PA and QoL. In general, these reviews provided support for the positive association of PA with QoL across different populations (Bize et al., 2007; Gillison et al., 2009; McAuley & Morris, 2007; Netz et al., 2005; Rejeski & Mihalko, 2001; Schechtman & Ory, 2001). In their systematic review, Bize et al. concluded that although cross-sectional data supported improvements in QoL dimensions associated with higher levels of PA, the effects of PA on QoL deemed to be tentative due to the limited amount of randomized controlled trials and cohort studies. In addition, Bize et al. pointed to the different dimensions of QoL being influenced by PA across different studies. Schechtman and Ory (2001) conducted a meta-analysis and reported a small positive effect of PA on the emotional aspect of QoL, with no significant effect on general health in frail older adults. A meta-analytical review carried out by Netz and colleagues (2005) demonstrated similar results by reporting that PA interventions had significant positive effects on well-being in healthy adults. In a recent meta-analytic review of exercise interventions on QoL, Gillison et al. (2009) found a small improvement in QoL in both clinical and non-clinical individuals who had exercise interventions. No significant effect of exercise interventions on general QoL was found in healthy individuals. When examined in more detail, people without clinical conditions showed improvements in physical and psychological aspects of QoL, which may seem to be associated with the intensity of PA.

Taken together, research evidence seems to indicate that higher levels of PA lead to improvements in many aspects of QoL. However, it should be noted that the association between PA and QoL is complicated and may involve a variety of factors that may influence the relationships (McAuley & Morris, 2007; Rejeski & Mihalko, 2001). Given the fact that no clear relationship between PA and overall QoL was found, an overview of factors associated with the relation of PA and QoL is necessary to have a fuller understanding of the PA-QoL relationship. Therefore, in the next section, potential factors that have been proposed to be linked to PA and QoL will be examined.

Factors Linked with a Relationship between Physical Activity and Quality of Life

Generally, current research evidence has clearly indicated beneficial effects of PA on QoL. However, the role of PA in QoL is largely complex due partly to different measures, research designs, analyses, cultural contexts, and duration and intensity of PA. In addition, the association between PA and QoL cannot be simply understood without understanding potential factors that may have an impact on the relation of PA and QoL (McAuley & Rudolph, 1995). Although a number of studies have taken into account various confounding variables assumed to influence PA and QoL, relatively little efforts were made to examine underlying factors that affect the association between PA and QoL (Elavsky et al., 2005; McAuley et al., 2006). Importantly, some research has reported little or no association between PA and a global construct of QoL or general well-being (Blacklock et al., 2007; Gill et al., 1997; Gillison et al., 2009; Ornes et al., 2005). Blacklock et al. (2007) suggested that demographic and lifestyle factors that are not taken

into account may have great influence on PA and overall QoL respectively. McAuley and Rudolph (1995) noted that a stable construct like global QoL may not be easily influenced by a short period of participation in PA. This is in concert with the notion that an investigation of a simple association between PA and global QoL may belie the positive effects of PA on physical and psychological aspects of QoL (Gillison et al., 2009). McAuley and colleagues (McAuley & Rudolph, 1995; McAuley et al., 2006) maintained that identifying factors that intervene or interact with the association between PA and QoL may provide a better understanding of the relationship between PA and QoL. Therefore, it is important to discuss how and what factors influence the relationship between PA and QoL.

In their reviews, McAuley and colleagues (McAuley & Katula, 1998; McAuley & Rudolph, 1995) proposed that self-related psychosocial constructs such as self-esteem, self-worth, and self-efficacy may be a key mediator of the relationship between PA and QoL. McAuley and colleagues (McAuley et al., 2006, 2008) conducted a series of studies to determine the mediating role of self-esteem, self-efficacy, and physical self-worth (PSW) through which PA exerts the favorable effect on QoL. They found that PA was indirectly associated with Global QoL via self-efficacy, and physical and mental status. Phillips et al. (2013) provided further support for self-efficacy as a mediator. Their study longitudinally investigated the mediational roles of self-efficacy, physical self-worth and disability limitations of the relationship between PA and QoL after controlling for confounders. They found that increasing levels of PA were related to higher scores of exercise self-efficacy, which were further associated with higher scores of PSW and

fewer disability limitations. Then, positive changes in PSW and physical health status were associated with higher levels global QoL.

The mediating roles played by self-esteem and self-efficacy on the association between PA and QoL have been consistently demonstrated. Elavsky et al. (2005) examined an indirect effect that PA has on QoL via several mediating factors in a sample of healthy sedentary older adults. They found that exercise self-efficacy and affect were identified as key mediating factors that transmitted the effect of PA on global QoL whereas PSW was only related to PA, but not to global QoL. Elavsky and McAuley (2005) used mid- to old-aged women experiencing menopausal symptoms in order to determine if PA indirectly leads to global QoL through PSW. Their findings revealed that PSW mediated the association between PA and global QoL. Elavsky (2009) examined a long-term effect of the walking and yoga intervention on QoL with other mediating variables such as affect and PSW. They found that at the end of the intervention, both PA and menopausal symptoms had a direct effect on PSW and positive affect, which in turn had a direct effect on menopause-specific QoL. It was also found that increased PA levels and decreased levels of menopausal symptoms were associated with higher PSW and positive affect. Positive changes in PSW and positive affect were further associated with improved menopause-specific QoL. The recent study by Joseph et al. (2014) assessed the mediational model by Elavsky et al. (2005). Their findings of the path model of the association among PA, self-efficacy, self-esteem, and QoL showed that PSW was the most important construct among the variables. PSW was related to all of the variables

included in the study. Although self-efficacy was significantly related to PA and PSW, it was not directly related to global QoL.

McAuley and Rudolph (1995) demanded the need to determine if individual and demographic characteristics moderate the association between PA and QoL. Hence, other researchers attempted to provide an explanation of mechanisms of the relationship between PA and QoL. Age has been proposed as a moderating factor. By reviewing exercise intervention studies for enhancing QoL, Netz et al. (2005) reported a decreasing effect size of PA on QoL gradually with advancing age. Vuillemin et al. (2005) reported that the association between PA and QoL were the lowest in the oldest age group. That is, the strength of the relation of PA and QoL may decrease with age. It was further supported by Oh, Jang and Gill's (2016) findings that age moderated the effect of PA on integrative QoL via physical and functional aspects of QoL.

Some researchers argue that the degree of improvement in QoL from participation in PA may be influenced by perceived importance or value that individuals have on PA (Rejeski & Mihalko, 2001) or outcome variables of PA (McAuley & Morris, 2007). In a conceptual model of the association between PA and QoL, McAuley and Morris (2007) proposed that the importance or value of PA and QoL outcomes placed by individuals may moderate the effect that PA has on QoL. They suggested that people who value PA may appreciate the benefits from PA greater than those who hold little or no value on PA.

Gender has been relatively understudied as a moderating factor. Gender differences have been consistently found in PA levels (CDC, 2014), general self-esteem (Kling, Hyde, Showers, & Buswell, 1999) and physical self-perceptions, (Fox & Corbin,

1989; Sonstroem et al., 1992), and QoL (Kirchengast & Haslinger, 2008) with men reporting higher PA levels, self-esteem and perceptions related to the physical self, and QoL.

McAuley and Rudolph (1995) examined if PA provides beneficial effects on QoL differentially by gender. They concluded that the evidence that supports gender differences for the association between PA and QoL is inconsistent. Netz et al. (2005) examined the moderating role of gender on the effect of PA on QoL; however, the gender composition failed to provide adequate explanatory power for each treatment and condition group. Further, under the random-effects model, no differential effects were found based on gender. They concluded that the degree of the association between PA and QoL might not be dependent on gender.

Together, the literature suggests that the self-related psychological constructs are major factors that need to be considered to better understand the association between PA and QoL. It has also been suggested that PA directly affects constructs that are more proximal, modifiable, and temporally sensitive, which in turn affect overall QoL, which is relatively a more stable construct (Elavsky et al., 2005; McAuley et al., 2008). In addition, there is good evidence to suggest that age may moderate the strength of the effect of PA on QoL. Although some reviews implied that perceived importance or value orientation may function as a moderator on the PA-QoL relationship, further research is warranted. Lastly, it has been suggested that the strength of the association between PA and global QoL may not differ by gender.

Relationship between Physical Activity and Quality of Life in Children and Adolescents

Evidence in a Clinical Population

Although research on the association between PA and QoL in children and adolescents was relatively understudied, research interest in the role that PA plays in enhancing young people's QoL has steadily grown over the last decade. The PA-QoL relationship has been studied in both clinical and non-clinical populations. Researchers have pointed to the importance of improving both PA levels and overall health and QoL in children and adolescents (Dalton et al., 2007; Gu et al., 2014). The rationale behind this is that PA begins to decline during late childhood or early adolescence (CDC, 2014; Korea CDC, 2017; Tremblay et al., 2014). This phenomenon of decreasing levels of PA is worrisome given the well-established fact that being physically inactive in childhood and adolescence results in a variety of negative physical and mental consequences (Strong et al., 2005). In addition, an increasing number of studies have indicated that adolescents have poorer QoL in comparison to children (Bisegger et al, 2005; Michel et al., 2009). Hence, an investigation of the research in children's and adolescents' QoL in relation to PA is as important as understanding this association in older adults whose QoL has been frequently studied with PA.

There are some intervention studies that assessed an effectiveness of the PA intervention on QoL in young people with clinical conditions. Speyer et al. (2010) conducted a cross-over randomized trial with hospitalized children and adolescents with cancer in order to determine the intervention effects on their QoL. Their intervention was

designed to be offered alternatively with two hospital stay periods that include adapted physical activity (APA) trials and two hospital stay periods. Speyer et al. collected self-report QoL scores from both young participants and their parents and found that children in the APA sessions showed higher participant- and self-reported scores of physical functioning, role limitations, self-esteem, and mental health. Additionally, there were significant differences in self-reported behavior scores and self-reported pain scores between hospital stays with APA and without APA. Self-esteem was the most affected aspect by the APA intervention. Speyer et al. concluded that individualized PA for young people with cancer may be accompanied by medical care during their hospitalization.

San Juan and colleagues conducted exercise training interventions with children and adolescents with leukemia. San Juan et al. (2007) examined the effect of intrahospital supervised aerobic-and-resistance-combined exercise training program on physiological and psychological outcomes. Although positive intervention effects on physiological indicators such as functional ability, aerobic capacity, and muscular strength were found, there was no significant effect on QoL. Another intrahospital exercise training intervention by San Juan et al. (2008) investigated the effectiveness of the intervention on functional capacity and QoL in young people who received bone marrow transplantation. The findings demonstrated beneficial effects on physical and physiological functioning and QoL. Specifically, improvement in QoL from the exercise group was larger compared to the condition group. While children rated higher comfort and resilience scores, parents rated higher participants' satisfaction and achievement.

Marchese, Chiarello, and Lange (2004) examined the effect of a therapeutic exercise intervention that included both stretching and aerobic exercise in children and adolescents with leukemia. The intervention was structured as home-based exercise in addition to five physical therapy sessions. Although physical functioning such as motion and strength improved due to the intervention, there was no significant improvement in parent- and self-reported QoL. Another RCT by Hartmann et al. (2010) investigated the effect of aerobic exercise training program on QoL in young people with congenital heart or cardiac conditions. The exercise intervention demonstrated beneficial effects on younger adolescents aged 10-15 years old. However, no effect was found in the older group aged 16-25 years old. More specifically, for younger adolescents, the improvement was found in self-reported cognitive functioning scores and parent-reported social functioning scores in comparison to the control group. However, for older adolescents and young adults, no improvement was found in none of the QoL dimensions.

Research evidence regarding the effect of PA on various dimensions of QoL has shown that there may be some psychological benefits that can be accrued from participation in PA for children and adolescents whose QoL is often impaired due to chronic conditions. Particularly, studies have indicated that PA generally has positive effects on physical functioning and socio-cognitive aspects in this population. It should be noted that different dimensions of QoL may be affected by PA, depending on the types of PA (e.g., aerobic, resistance, or combined exercise) or the structure of PA programs (e.g., PA vs. APA, or group exercise vs. home exercise). Further, some research included a wide range of age groups (e.g., Dulfer et al., 2014; Marchese et al., 2004; San Juan et

al., 2008). Also, San Juan et al. (2007) had a small sample - seven children aged 4-6 years old as parents of children of an age- and gender-matched control group did not consent to the exercise training program. Also, Hartmann et al. (2010) found the effect of the PA intervention on QoL differed by age. Given the potential role of age, PA may differentially influence QoL of young people with health impairment due to chronic diseases. Further research is warranted to examine the role of age in the relationship between PA and QoL.

Evidence in a General Population

Although it has been well-accepted that PA provides numerous physical and mental benefits not only for chronically ill young people, but also for well young people (Strong et al., 2005), it has been suggested that research on the role of PA on QoL has often been focused on school-aged children and adolescents with chronic illness (Hartmann et al., 2010). It has not been long since researchers have begun to investigate the association between PA and QoL in healthy children and adolescents. Most studies sought to examine the cross-sectional associations between self-reported or objectively-measured PA and multiple dimensions of QoL. In contrast, there are very few intervention and longitudinal studies in healthy young people.

One study by Hartmann et al. (2010) assessed the efficacy of one-year school-based PA program on QoL in elementary school children. The only significant intervention effect was found for psychosocial QoL in first graders. However, the school PA intervention did not significantly affect physical QoL in first graders and physical and

psychosocial QoL in fifth graders. Also, the significant difference in the first graders' psychosocial QoL between the intervention and control group was largely because the first graders' psychosocial QoL in the control decreased. Their subpopulation analysis further revealed the positive intervention effects for psychosocial QoL in urban and overweight first graders. Casey et al. (2014) conducted a cluster-randomized controlled trial with Australian adolescent girls in grades 7–9 who live in the low socioeconomic rural area. This study examined if an intervention involving school PA and PA participation in the community leads to better QoL. The results revealed that physical and psychosocial aspects of QoL and global QoL were higher in the intervention group compared to the control group. Subsequent subgroup analysis further revealed that whereas the intervention non-completers showed higher QoL than the control group, the QoL scores did not differ between the intervention completers and the control group. Authors surmised that the non-significant effect between these groups may be caused by ceiling effect of the intervention completers and smaller sample size of this group. However, when analyzing the pre-post change revealed that the control group had decreased QoL whereas the intervention group maintained QoL. It can be concluded that PA prevented physically active adolescent girls from having poor QoL.

Chen, Sekine, Hamanishi, Yamagami, and Kagamimori (2005) examined the longitudinal associations between QoL and lifestyle factors including frequency of PA in Japanese children aged 9-10 years old over the 3-year period. The frequency of PA ranged from very often, often, seldom, to almost never. It was found that children who seldom or almost never participated in PA at baseline showed poorer QoL at follow up

when compared to children who reported PA participation very often at baseline. It was also found that children who relapsed from often to seldom and children who sustained seldom PA participation showed poorer QoL than children who maintained their PA levels. Another longitudinal study by Jensen, Cushing, and Elledge (2013) examined the longitudinal association among PA, teaching during PA, and QoL in 9- to 12-year-old preadolescents. They found that PA predicted PA and QoL predicted QoL respectively over the 1-year period. Although PA was associated with later QoL in healthy weight adolescents, no longitudinal association was found between PA and QoL.

There is a growing interest in cross-sectionally investigating the relationship between PA and QoL among young people. Most of the cross-sectional studies support the positive association of regular participation in PA with QoL in this population. For instance, Iannotti and colleagues (2009a, 2009b) conducted cross-sectional cross-national studies to investigate the relation of PA to several indicators of QoL. Iannotti et al. (2009a) found that PA was positively associated with physical self-image, physical health status, quality of family and peer relationships, and possible self in both Canadian and American young people. Further, PA was negatively related to negative health behaviors such as cigarette smoking, alcohol use, and health complaints. It should be noted that different associations were found between PA and negative health behaviors, depending on the country. Iannotti et al. (2009b) expanded the previous findings by the positive association between PA and multiple indicators of QoL in five regions (North America, Western Europe, Eastern Europe, Northern Europe, and Southern Europe) consisting of 10 countries. Specifically, the results showed that PA was positively associated with self-

image, physical health status, family relationships, peer relationships, and global QoL in all regions. Other studies in different countries such as Australia (Lacy et al., 2012), Canada (Wu et al., 2011), Malaysia (Wafa et al., 2016), and Iran (Jalali-Farahani, Amiri, & Chin, 2016) reported similar findings that higher levels of PA were associated with higher global QoL (Lacy et al., 2012) and higher scores of several domains of QoL (Jalali-Farahani et al. 2016; Wafa et al., 2016; Wu et al., 2011).

Some researchers categorized PA levels into meeting the PA levels and not meeting the PA levels in relation to QoL. For instance, Shoup et al. (2008) conducted a cross-sectional research in overweight and obese children aged 8–12 years old and found that independent of weight status of children, children who reached the recommended PA levels had better physical, psychosocial, and total QoL than children who did not. Breslin et al. (2012) compared multiple domains of QoL between children who met the recommended PA guidelines and children in Northern Ireland. They found that there were significant differences between children who achieved the recommended PA guidelines and those who did not. Specifically, when children met the recommended PA levels, they reported higher scores comfort, satisfaction, resilience and achievement and lower risk scores of avoidance as measured by the Child Health and Illness Profile relative to those who did not. Also, children who met the recommended PA levels showed higher scores of social acceptance and social support, as measured by the KIDSCREEN and self-esteem than those who did not. Breslin et al. (2017) supported previous findings by identifying the difference in QoL between physically active and inactive children in Northern Ireland and the Republic of Ireland. Specifically, children

who met the recommended PA levels reported better physical well-being, psychological well-being, parent and autonomy, social support, and school environment scores as compared to those who did not. There were regional differences, but the direction of the relationship remained the same.

Very few studies have shown the non-significant association between PA and QoL. For example, Morgan et al. (2008) investigated the association between accelerometer-based PA and several variables such as demographic factors, behavioral factors, and QoL among 5- to 9-year-old obese children. They found no significant association between PA and QoL. However, it should be noted that some of the QoL dimensions had poor reliabilities: physical functioning ($\alpha = 0.61$), emotional functioning ($\alpha = 0.54$), social functioning ($\alpha = 0.67$), and school functioning ($\alpha = 0.49$). The authors attributed no relationship between PA and QoL partly to the low reliability of QoL. Boyle et al. (2010) examined the relation of PA to QoL among English children and adolescents aged 11 - 15 years old. Their results showed no difference scores in various dimensions of QoL between participants who reached the recommended PA levels and those who did not, except for global QoL as measured by visual QoL measure (EQ-5D visual analogue scale [VAS]).

Clearly, the literature on the association between PA and QoL in relatively healthy children and adolescents without chronic conditions indicated that multiple dimensions of QoL are positively related to PA whether PA is described as meeting PA guidelines or frequency of PA participation. Importantly, some studies had participants from different countries (e.g., Iannotti et al. 2009a, 2009b) and found positive

associations across regions. The association between PA and QoL appear to be positive globally given that positive associations can be found in the North American, European, and Asian countries. However, it is important to mention that most of the studies are correlational, and thus no causal relationship cannot be inferred. Moreover, lack of intervention and cohort studies in the literature inhibits definitive conclusions of the causal relationship between PA and QoL.

Factors Linked with a Relationship between Physical Activity and Quality of Life

Despite the clear evidence from studies in older adults that the relationship between PA and QoL is complex with multiple factors, there have been limited studies that illustrate this complex relationship among children and adolescents. Available research evidence in this young population mainly addressed mediating factors on PA and QoL. There are very few studies that examined moderating factors that influence the strength of the relationship between PA and QoL. For example, Gu et al. (2016) examined the mediating role of fitness on the association between self-reported and pedometer-based PA with physical and mental domains of QoL in elementary children aged 9-11 years old. Each component of physical fitness (e.g., cardiorespiratory fitness, muscular fitness, flexibility, and body composition) was measured, translated to z-scores, and summed up to produce a total physical fitness score. It was found that both self-reported PA and pedometer-based PA significantly predicted physical and mental domains of QoL and a total score of QoL. Furthermore, total physical fitness was found

to mediate the association between self-reported PA and total QoL and between objectively-measured PA and total QoL.

Finne et al. (2013) examined the association between PA and QoL and the mediating role that body dissatisfaction plays on this association in German adolescents. It was found that PA levels are positively correlated to almost all domains of QoL with an exception of school-related QoL for boys and family-related QoL for girls. It was further found that the effect of PA on QoL was mediated by body dissatisfaction for both girls and boys. More specifically, higher frequency of PA was indirectly associated with higher physical, emotional, self-esteem, family, friends, and school domains of QoL through reduced body dissatisfaction. However, authors noted the results need to be interpreted with caution as the indirect effects of PA through body dissatisfaction were small.

Gender differences in various aspects related to PA and QoL have been reported in children and adolescents. Research has shown that male adolescents typically have higher QoL (Bisegger et al., 2005; Michel et al., 2009), higher PA levels (Sallis, Prochaska & Taylor, 2000; Song, Carroll, & Fulton, 2013), and physical self-perceptions (Asci, 2002; Whitehead, 1995). Particularly, a meta-analytic review by Kling et al. (1999) found that the effect size of the gender differences in overall self-esteem was the largest in adolescents. Despite the potential role that PA may play in the association between PA and QoL in children and adolescents, to the best of knowledge, no research to date has been found that investigated gender as a moderator of the relationship between PA and QoL.

Current literature concerning factors associated with PA and QoL has indicated that PA may indirectly affect QoL via physical fitness or body-image-related factors or that PA is directly and indirectly influenced by psychological factors such as PNS and expectancy-related beliefs and task values. Although there is limited evidence that suggests mediating moderating factors of the association between PA and QoL, available research has clearly shown that the link between PA and QoL is complex, which apparently warrants future research that aims to consider potential underlying factors that explain the relationship between PA and QoL.

Relationships among Physical Activity, Physical Self-Worth and Physical Self-Perceptions

Children's and adolescents' self-perceptions have extensively been studied in various disciplines (Horn, 2004). Research evidence suggests that possessing positive perceptions about themselves, abilities, and competencies bring about numerous positive outcomes (Horn, 2004). Craven and Marsh (2008) pointed out that "self-concept is one of the most all-pervasive characteristics of humans that is central to psychological well-being and a powerful mediating influence on psychosocial constructs that underpin human potential (p.114)." A substantial body of research has supported positive associations between self-concept and several health outcomes that reflect psychological functioning (Harter, 1999; Rosenberg, 1965; Rosenberg & Kaplan, 1982). Further, low self-esteem has been shown to manifest poor health-related behaviors and various negative mental health symptoms (Fox, 1999). Fox (2000) listed several positive

elements associated with higher self-esteem: "life satisfaction, positive social adjustment, independence, adaptability, leadership, resilience to stress, and high level of achievement in education and work" (p. 88). In light of the research findings that highlight the importance of self-concept and self-esteem for overall well-being, it is reasonable that there were a variety of approaches that aimed to explain how to increase self-concept and self-esteem (Horn, 2004).

Researchers have begun to examine if PA has a positive relation to global self-worth, self-esteem, and subdimensions. Also, specific associations between PA and physical self-concept and between PA and subdimensions of physical self-perception have been studied. Sufficient research evidence has shown that PA is positively associated with self-concept, physical self-concept, and subdomains in adults (McDonald & Hodgdon, 1991; Spence, McGannon, & Poon, 2005) and children and adolescents (Babic et al., 2014; Ekeland, Heian, & Hagen, 2005; Gruber, 1986). There is cross-sectional evidence indicating that higher levels of PA are positively related to higher self-concept (Crocker, Eklund, & Kowalski, 2000; Dishman et al., 2006).

Calfas and Taylor (1994) reviewed effects of PA on multiple psychological outcomes including self-perceptions. The authors reported that the PA had a consistent effect on self-perceptions such as self-esteem, self-concept or self-efficacy. There were weak positive associations between PA and global self-concept and between PA and subdomains of the global self-concept that is not related to PA (e.g., social and academic self-concept) (Strong et al., 2005). However, a moderate positive association between PA and physical self-concept was found (Strong et al., 2005). Such findings are in concert

with the findings from the meta-analysis of the effectiveness of exercise interventions on global self-esteem. Spence et al. (2005) reported the small yet significant effect size by reviewing both published and unpublished studies that examined the effect of exercise on global self-esteem in adults. Fox (1999) explained the findings by pointing to the theoretical underpinnings that global self-esteem is relatively a stable and distal construct that may not be easily modified.

Several meta-analytic reviews have supported the effect of PA on self-esteem and physical self-concept. Gruber (1986) conducted the first meta-analysis to examine the effect of physical education programs for children in relation to self-esteem. The results revealed an overall small positive significant effect size for self-esteem. It was found that children who had mental and learning disabilities or economical disadvantages had larger effects. Furthermore, larger effects were found for physical fitness and aerobic programs relative to movement- and sport skill-based programs. Another meta-analysis conducted by McDonald and Hodgdon (1991) examined the effects of aerobic fitness training on self-concept in adults. The authors reported that aerobic fitness training yielded medium effect size for self-concept. However, this study combined global self-esteem, body image, and physical self-concept and so the respective effect size in this study is unknown. A meta-analytic review of RCTs in young people aged from 3 to 20 examined the effect of exercise on improvement in self-esteem (Ekeland et al., 2005). The findings showed a small but significant treatment effect, suggesting that exercise interventions generate positive short-term effects on self-esteem in young people; however, the authors emphasized that only one of the studied included in the analysis had a low risk of bias

and only 12 studies were available for analysis out of 23 studies due to inappropriate data and cluster randomization.

A recent systematic meta-analysis of the association between PA and physical self-concept and subdimensions in children and adolescents was conducted by Babic et al. (2014). Overall, a significant small to moderate association between PA and physical self-concept was found. Importantly, sex was found to be a significant moderator of the effects. For perceived competence, the effect size was moderate and age was found to be a significant moderator. As for perceived fitness as reflected by different elements of physical fitness such as strength, endurance and flexibility, the combined effect size was moderate. For perceived appearance, a weak effect size was reported with age being a significant moderator. Notably, sex and age were found to be moderators of the effects. Specifically, the effects of PA on general physical self-concept were larger for boys than girls. The effects of PA on perceived competence were larger for early adolescents relative to children and late adolescents. The effects of PA on perceived appearance were larger for early adolescents than late adolescents. The authors concluded that the effect of PA on physical self-concept and subdomains of physical self-perception was positive in young people. The authors further concluded that the association between PA and physical self-concept may be reciprocal rather than one-way directional relationship.

Hayes et al. (1999) found gender differences in the mediating effect of PSW. They showed that PA was related to all subdimensions and PSW for men. In contrast, PA was only related to one subdimension of physical self-esteem – that is, conditioning for women. They suggested that women's self-perceptions relative to PA may have different

consequences in comparison to men. Haugen et al. (2011) examined the effect of PA on global self-worth via three mediators (e.g., athletic competence, body satisfaction, and appearance evaluation) and moderating effects by gender. They found that the indirect effect that PA has on global self-worth via body satisfaction and physical appearance attractiveness was different between male and female adolescents. Specifically, the degree of the indirect effect was larger for female adolescents compared to male adolescents, indicating that gender functioned as a moderator on the indirect effect of PA on global self-worth.

The current literature regarding the relation of PA to self-perceptions has demonstrated the consistent association between PA and self-concept, self-esteem, physical self-concept, and multiple subdimensions. In general, PA has medium effects on improvements physical self-perception, small to moderate effects on physical self-concept, but relatively smaller effects on global self-esteem. In addition, self-esteem has been recognized as a key construct that improves numerous psychological benefits. Importantly, Babic et al. (2014) found that age and sex moderate the association between PA and physical self-concept and between PA and perceived competence and appearance. Babic et al. further suggested that exploration of pathways of the relationship is needed.

Measures

PACE+ Adolescent Physical Activity Measure

The PACE+ Adolescent Physical Activity Measure is a PA measure that consists of two items (Prochaska, Sallis, & Long, 2001). The two items are almost identical

except for asking if PA was practiced during the past week or during a typical week. Those two items are used in this study as recommended by Prochaska et al. (2001). These items assess how many days per week adolescents had engaged in moderate to vigorous physically activity (MVPA) for at least 60 minutes each day. Instructions include examples that help students understand MVPA. It should be noted that MVPA practiced in PE classes was excluded in Prochaska et al.'s measure; however, in the present study, the instruction that PE classes are not counted as PA was removed and so PA during PE classes was included in our measure. This measure is also useful in easily determining if adolescents meet the recommended PA guidelines for health benefits.

Using a sample of middle school students, Prochaska et al. (2001) reported test-retest reliability and concurrent validity with the Computer Science and Applications accelerometer. The Intraclass correlation coefficient (ICC) was 0.77, with the ICC being 0.76 controlling for time to retest. Whereas the ICC was 0.88 when retested for the same day, the ICC was 0.53 when retested after the 1-month period. Cohen's Kappa was also calculated and found to be substantial (k = 61%). Whereas the Cohen's Kappa was more than substantial (k = 84%) when retested for the same day, the Cohen's Kappa dropped below fair (k = 36%) when retested after a 1-month period. The score was also significantly correlated with accelerometer data (r = 0.40), indicating an acceptable level of concurrent validity.

Biddle, Gorely, Pearson, and Bull (2011) reviewed existing self-report PA measures specifically used for youth and formed the international expert group to evaluate the measures. The PACE+ Adolescent Physical Activity Measure was

recommended as the best measure for youth because of its sound psychometric scores such as validity and reliability. Also, this measure had a good rating because it is short and easy for young people to understand and complete. This measure has been used by several researchers. For example, Janssen et al. (2005) found a negative association between PA participation and BMI classification by using this PA measure for youth. Specifically, higher PA scores were related to lower odds ratios for overweight. Furthermore, Butcher, Sallis, Mayer, and Woodruff (2008) found the different compliance rate of meeting recommended PA guidelines between male and female adolescents by using this PA measure, which provides additional support for the validity of this measure. Taken altogether, this measure is a valid and reliable measure that has been used and recommended by several researchers.

Children and Youth Physical Self-Worth Scale

The Children and Youth Physical Self-Worth Scale (CY-PSWS) is a 6-item subscale stemming from the Children and Youth Physical Self-Perception Profile (CY-PSPP). Whitehead (1995) modified the Physical Self-Perception Profile (PSPP) developed by Fox and Corbin (1989) so that the CY-PSPP can be used for children and adolescents.

The PSPP consists of one subscale relative to global physical self-worth (PSW) and four separate subscales subject to global physical self-worth (e.g., sport competence, physical condition, body attractiveness, and physical strength). Each subscale has 6 items and thus the PSPP has a total of 30 items. Fox and Corbin (1989) reported adequate

reliability of the scales with Cronbach's alpha coefficients ranging from .81 to .92 and acceptable test-retest reliability over the 16-day period of time (α = .74 - .92) and over the 23-day period of time (α = .81 - .88).Also, concurrent and construct validity were established based on several factor and regression analyses. Specifically, four subscales of the PSPP were identified as separate constructs, but contributed to the overall PSW. A three-level hierarchical structure was confirmed, in which PSW emerged as a key construct to the relationship between subdimensions of the PSPP and global self-esteem.

Despite the sound psychometric scores of the PSPP, Fox and Corbin (1989) primarily used a sample of university undergraduate students and therefore its use for other populations was limited. Hence, Whitehead (1995) changed the wording of the items based on the results from a pilot study (Whitehead & Corbin, 1988), which resulted in more concise and understandable wording of each item for school-aged children and adolescents. Whitehead (1995) examined reliability and validity of the modified version of the PSPP by using a sample of middle school seventh and eighth graders and established both the reliability and validity of the CY-PSPP for young people. The hierarchical structure with the PSW mediating the relation of subdimensions of general physical self-worth and global self-esteem was supported. Further, factorial validity for the hierarchical structure model of the CY-PSPP has been confirmed in both children (Welk & Eklund, 2005) and adolescents (Eklund, Whitehead, & Welk, 1997). Internal consistency of the CY-PSPP, CY-PSWS and global self-worth was adequate with Cronbach's alpha coefficients ranging from .80 to .90 for both male and female adolescents. The ICCs and Cronbach's alpha coefficient were examined to assess the test-

retest reliabilities over the 2-week period. Both the ICC and Cronbach's alpha coefficient of the CY-PSWS were found to be adequate, indicating the stability of the scale over time (ICC = .86; α = .94). For the four subscales, the ICCs ranged from .90 - .94 and Cronbach's alpha coefficients ranged from .87 - .92, all of which represent high reliability scores. Notably, the gender difference in the CY-PSWS was found, with female adolescents reporting lower scores of the PSW, which is indicative of discriminant validity. Different scores of the PSW and other subdomains of the PSPP between genders have been consistent and so separate analyses for each gender have been recommended (Fox, 1990; Whitehead, 1995).

The PSWS has been frequently used as a single dimension measure, independent of the PSPP in various fields by many researchers. Not only has it been frequently used as a single construct, but also Fox (1990) was supportive of the selective use of subscales of the PSPP if its use fits research questions. Previous studies that used the PSWS as a single construct measure have reported adequate reliability, exceeding .80 (Elavsky, 2009; Elavsky et al., 2005; Joseph et al., 2014; Phillips et al., 2013). The CY-PSWS has also been used for middle school students and was found to have the adequate reliability (α = .80) (Whitehead & Corbin, 1991). Overall, good psychometric scores have been reported in studies that used the CY-PSWS, demonstrating its practical utility for adolescents.

KIDSCREEN Measures

The KIDSCREEN instruments were designed to assess children's and adolescents' HRQoL (The KIDSCREEN Group Europe, 2016). There are three types of instruments, depending on the number of dimensions, items, and focus of the instruments (e.g., the KIDSCREEN-10, KIDSCREEN-27, and KIDSCREEN-52). The KIDSCREEN-52 was a first measure developed by Ravens-Sieberer et al. (2005) and the KIDSCREEN-27 was developed as a short version of the KIDSCREEN-52 to lower the response burden and time of the original version. While the KIDSCREEN-52 has 10 dimensions, consisting of a total of 52 items, the KIDSCREEN-27 has five dimensions with 27 items. The shortest version, KIDSCREEN-10 is a 10-item measure that assesses global HRQoL. 10 dimensions of the KIDSCREEN-52 include physical well-being (5 items), psychological well-being (6 items), moods and emotions (7 items), self-perception (5 items), autonomy (5 items), parent relation and home life (6 items), financial resources (3 items), social support and peers (6 items), school environment (6 items), social acceptance (bullying) (3 items). These dimensions were abridged and combined in the KIDSCREEN-27 and thus five dimensions of the KIDSCREEN-27 were identified: physical well-being (5 items), psychological well-being (7 items), parent relations and autonomy (7 items), social support and peers (4 items), and school environment (4 items).

Using a sample of 22,110 children and adolescents aged from 8 to 18 years across 12 European countries, Ravens-Sieberer et al. (2005) investigated psychometric properties of the KIDSCREEN-52. Both reliability and validity of the KIDSCREEN-52 demonstrated good internal consistency reliability, with Cronbach's Alpha coefficients

ranging from .77 to .89. The reliability of most dimensions was adequate with the ICCs ranging from .56 to .77. The discriminatory power of each dimension of the KIDSCREEN-52 was reported to be satisfactory with Ferguson's δ ranging from .84 to .99 except social acceptance (bullying).

Convergent validity was examined by comparing subdimensions of the KIDSCREEN-52 with subscales of other measures used to assess HRQoL for young people (e.g., KINDLR). Moderate to high correlations between most of the dimensions of these instruments were found. Age differences in all dimensions of the KIDSCREEN-52 were also found, with children reporting higher scores than adolescents. The KIDSCREEN-52 discriminated gender for physical well-being and self-perception, but not for other dimensions. Specifically, relative to girls, boys reported higher scores in dimensions related to physical health and perception of self. Additionally, children and adolescents who perceive their socio-economic status as high tended to report higher scores in nearly all dimensions of the KIDSCREEN-52, except social acceptance (bullying). Notably, the results of confirmatory factor analysis and multitrait multi-item analysis supported the structure of the constructs. Further, the results of inter-scale correlation confirmed distinct constructs of the KIDSCREEN-52 (The KIDSCREEN Group Europe, 2016).

Ravens-Sieberer et al. (2007) used a sample of 22,827 children and adolescents aged from 8 to 18 years across 13 European countries in order to test psychometric scores of the KIDSCREEN-27. Good internal consistency reliability was found, with Cronbach's Alpha coefficients ranging from .80 to .84. Reliability of this measure was

found to be acceptable with the ICCs ranging from .61 to .74. Dimensions of the KIDSCREEN-52 showed satisfactory scores of discriminatory power, with Ferguson's δ ranging from .81 to .99.

Criterion validity was assessed by analyzing correlations between similar scales of the KIDSCREEN-27 and KIDSCREEN-52. They are found to be satisfactory (r = 0.71 - 0.96), except for the correlation between the psychological well-being of the KIDSCREEN-27 and self-perception of the KIDSCREEN-52 (r = .63). Convergent validity was also demonstrated by finding moderate to high correlations of the most subdimensions of the KIDSCREEN-27 with theoretically similar dimensions of other questionnaires that measure QoL (e.g., Pediatric Quality of Life Inventory™ [PedsQL™]). Additionally, known groups validity was established by discriminating between children and adolescents in good health and those in poor health for all of the dimensions. Gender, socio-economic status and age differences were found in nearly all dimensions of the KIDSCREEN-27, which is consistent with the previous findings in the QoL literature. Specifically, children had higher HRQoL scores than adolescents. Higher perceptions of socio-economic status were associated with higher scores of the KIDSCREEN-27. Whereas male adolescents had higher scores in physical well-being, psychological well-being, and parents relation and autonomy, female adolescents had higher scores in social support and peers.

Ravens-Sieberer et al. (2010) examined reliability, construct and criterion validity of the KIDSCREEN-10 in a sample of 22830 young people. Correlations between the KIDSCREEN-10 and the KIDSCREEN-52 were examined to demonstrate criterion

validity. Two dimensions of the KIDSCREEN-52 (e.g., financial resources and social acceptance) were found to have low correlations ranging from .24 to .42. The social support and peers dimension had correlation coefficients around .50; other dimensions showed correlation coefficients around .60 or above. The correlation between the KIDSCREEN-10 and ad hoc calculated general factor scores of the KIDSCREEN-52 was high (r = .91). The KIDSCREEN-10 showed adequate internal consistency reliability with Cronbach's alpha coefficients (α = .82). The ICC for test-retest reliability was acceptable (ICC = .70).

Convergent validity was tested by examining the correlation between the KIDSCREEN-10 and other measures. Low to moderate correlations were found, which indicate minimal support for the convergent validity. Known groups validity was supported by identifying the group differences in HRQoL scores between healthy and unhealthy youth. Also, children showed higher HRQoL scores than adolescents. Thus, the KIDSCREEN-10 demonstrated its valid use as a single measure of HRQoL for young people.

It should be pointed out that the KIDSCREEN instruments used a large dataset of children and adolescents from multiple countries from the start of the instrument development. This instrument has demonstrated its practical use across multiple countries. At the heart of this measure is a cross-culturally standardized instrument that evaluates HRQoL for young people (Ravens-Sieberer et al., 2005). Psychometric properties across many countries demonstrate cross-cultural validity and applicability of the KIDSCREEN measures (Robitail et al., 2007).

Hong et al. (2007) translated the original KIDSCREEN-52, developed the Korean version of the KIDSCREEN-52 (K- KIDSCREEN-52), and investigated reliability and validity. Cronbach's alpha coefficients of each scale were above .80 except for self-perception ($\alpha = .77$). The test-retest reliability of this measure was .76. The correlations between the K- KIDSCREEN-52 and other QoL measures showed limited support. Specifically, the K- KIDSCREEN-52 had moderate correlations with PedsQL^{TM} for physical and emotional dimensions, but low correlations for school and social dimensions. In addition, gender differences were found in physical well-being and self-perception domains. Boys had higher scores of both dimensions than girls. The K- KIDSCREEN-52 showed adequate psychometric properties and thereby supporting its use to assess HRQoL in Korean adolescents.

Summary and Gaps Identified in the Literature

This chapter provided an overview of the current literature on the association between PA and QoL and between PA and physical self-perceptions. First of all, operational definitions of the variables were established, which provided a fundamental foundation for this review. Then, the current evidence on the association between PA and QoL in both older adults and children and adolescents was reviewed. The research evidence has suggested that regardless of health status, age, gender, race/ethnicity, measures, and research designs, PA is positively associated with multiple subdomains of QoL or overall QoL. Also, the literature on the effect of PA on self-perceptions has indicated that PA enhances subdomains of PSW, global PSW, or global self-concept.

Furthermore, PSW has been found to mediate the relationship between subdomains of PSW and global self-concept. Measures that will be used in this study such as PACE+ Adolescent Physical Activity Measure, CY-PSWS, KIDSCREEN were found to be reliable and valid for adolescents. However, several limitations found in the current literature should be discussed

Although there is rapidly growing interest in the association between PA and QoL in young people, research evidence that provides clear explanations of the association between PA and QoL in this population remains relatively limited. There is good evidence that the effect of PA on QoL is mediated through several pathways. That is, PA directly influences variables that connect PA with QoL. Mediating variables found in the current literature are health status, affect, and self-related components such as self-esteem, self-efficacy, and PSW. Particularly, PSW has been found to be a salient construct that mediates the association between PA and QoL in college-aged young adults. However, no study to date has examined the role of PSW in the relationship between PA and QoL in adolescents. In addition, although gender has not been found to be a moderator of the association between PA and QoL, gender may act as a moderating factor on the link between PA and PSW or between PA and subdomains of PSW. No available research has investigated the role of gender in the relationships among PA, PSW, and QoL. Potentially different effects of PA on PSW and in turn on QoL depending on gender should contribute to fuller understanding of the association and thereby provide effective and practical guidelines for interventions with adolescents. Given that PA levels, self-esteem, and QoL decline throughout the adolescent years, it is imperative to explore the

relationships among these important constructs to better understand how to improve and maintain PA and PSW, and in turn enhance QoL for adolescents.

CHAPTER III

METHODS

This chapter provides an overview of the methodology used to examine the relationships among variables such as physical activity (PA), physical self-worth (PSW), and quality of life (QoL) as well as gender. This chapter provides information on research design, procedures, participants, measures, and statistical analyses implemented in the study.

In brief, the current study utilized established self-report questionnaires to obtain demographic information as well as information on PA, PSW and QoL. Following descriptive and preliminary analyses, the mediating role of PSW on the relationship between PA and QoL variables, and the moderating role of gender on the relationships among PA, PSW and QoL were investigated. Korean middle school-aged adolescents were recruited from one public middle school in Seoul, Korea and data from 236 students were used for analyses.

Research Design

The primary purpose of this study was to examine if PSW mediated the effect of PA on QoL variables among Korean middle school students. Further, it was examined whether gender moderated the indirect effect of PA on global and subdomains of QoL via PSW.

The present study was cross-sectional, using the self-report survey data from middle school students. A cross-sectional research design is often used to obtain a large dataset from a population at a one-time point. Cross-sectional studies are typically conducted to provide a snapshot of the variables of interest and associations among those variables.

Procedures

School administrators of a public school located in Seoul, Korea were contacted to obtain permission for the current study. Then, the primary investigator (PI) had a meeting with the principal and PE teacher of the school. Approval was obtained from the Institutional Review Board (IRB) of the University of North Carolina at Greensboro. Middle school-aged adolescents who attended the designated school were recruited through regular physical education (PE) classes or meetings with a homeroom teacher at the end of the day at the end of Korean public school academic year (December,2017).

The PI was introduced by the PE teacher during regular school hours. The nature of the study was briefly explained to the participants by the PI or PE teacher during these times. If participants were interested and willing to participate in the study, they were asked to take a parental informed consent form to their parent or guardian, which described the nature of the study. Both the parental consent form and child assent form were obtained. Data collection took place at one time during school hours. Participants were asked to complete six questionnaires in the following order: 1) demographic questionnaire; 2) PA questionnaire; 3) PA types measure; 4) PSW; 5) selective

subdimensions of QoL; 6) global QoL. The questionnaires used in this study can be found in Appendices. After distributing the questionnaires, the PI provided a brief verbal explanation of nature of the study. Participants were informed that the completion of questionnaires would take approximately 20 minutes and that they could withdraw from the study at any time without any penalties. They were also informed that their response would be coded anonymously and remain confidential. They were assured that the data collected in this study would not be shared with school administrators, homeroom teachers or PE teachers of the school. Finally, students were encouraged to provide answers as honestly as possible and to ask questions freely if they need assistance or clarity of items of the measures from the PI or PE teacher.

A pilot study of seven middle school students from the same school was conducted first to ensure the understanding of the wording of the items on each questionnaire, instructions and procedures of the study. Participants in the pilot study were encouraged to freely discuss any issues or concerns during the administration of the pilot study. Based on their suggestions, minor typos were corrected and tables were rearranged, but no changes were made to the items.

Participants

A sample of 310 Korean middle school-aged adolescents was recruited. Participants were middle school first graders and third graders. A dataset of 236 students was used for the present study as questionnaires from 74 students were not completed. All of the participants were enrolled in the middle school in which this study took place.

Measures

Demographic Questionnaire

Demographic information was collected regarding participants' age, gender, and grade. Demographic information provided characteristics of the participants in this study.

PACE+ Adolescent Physical Activity Measure

PACE+ Adolescent Physical Activity Measure (PACE+) is a recall-based self-report instrument designed to be used for adolescents. On the top of the questionnaire, the definition of PA is introduced as "any activity that increases your heart rate and makes you get out of breath some of the time" (Prochaska et al., 2001, p. 558), which reflects moderate-to-vigorous PA (MVPA). Examples of MVPA are provided next. Examples include running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football, and surfing. It is also noted that sports, playing, and walking can be considered part of PA. Although the original questionnaire excluded MVPA during PE classes, participants were asked to include MVPA during school PE classes in the present study.

This 2-item instrument asks participants to recall the number of physically active days they had for the minimum amount of 60 minutes per day during the past 7 days and for a typical week. The first item asks MVPA during the past week whereas the second item asks MVPA during a typical week. Adolescents were asked to sum up all of the time used for all types of PA for the whole day. Days per week spent participating in MVPA were produced by calculating the mean of the two items. The scores of the responses

range from 0 to 7, with 0 representing none of the days per week spent on MVPA for the accumulated amount of 60 minutes and with 7 indicating everyday spent on MVPA. If participants report five or more days spent on MVPA per week, they meet the recommended PA guidelines for children and adolescents.

Physical Activity Types Questionnaire

This measure was intended to identify the types of current PA participants practiced. The first item asked students to provide one primary PA they practiced most often. The second item asked students to report other types of PA they practiced other than the primary PA. The items were open-ended, and thus participants were able to freely choose types of PA in which they typically participated.

Children and Youth Physical Self-Worth Scale

The Children and Youth Physical Self-Worth Scale (CY-PSWS) is a 6-item scale designed to assess individual's perception of global physical self. The CY-PSWS is a subscale of Whitehead's (1995) Children and Youth Physical Self-Perception Profile (CY-PSPP) developed to measure physical aspects of self-perception specifically for youth. The CY-PSPP is an adapted version of the Physical Self-Perception Profile (PSPP) developed by Fox and Corbin (1989). The CY-PSWS reflects perceptions of pride, happiness, confidence, satisfaction, and feelings about a physical aspect of self in adolescents.

Participants were asked to carefully read the brief instruction on the top of the questionnaire. An example below the instructions is provided to help participants understand the general procedure of the questionnaire. This measure utilizes a four-choice structured alternative format. There are two steps to complete the questionnaire. First, participants were asked to choose one of the two statements that best fit their characteristics (e.g., "Some kids are proud of themselves physically", BUT "Other kids don't have much to be proud of physically."). Then, participants were instructed to mark the degree to which a chosen statement was true for them between two choices (i.e., "really true for me" or "sort of true for me"). One item of the CY-PSWS was reverse-coded. All items were summed to produce a total score, which ranges from 6 to 24, with a high score representing a high level of PSW for youth. All dimensions of the CY-PSSP were measured, but only the CY-PSWS was used for the current study.

KIDSCREEN-52

The KIDSCREEN-52 is one of the KIDSCREEN instruments designed to assess children's and adolescents' QoL (Ravens-Sieberer et al., 2005; The KIDSCREEN Group Europe, 2016). The KIDSCREEN-52 has 10 subdimensions and consists of 52 items. Selective subdimensions were measured for the current study, because some of the dimensions of the measure were considered to be irrelevant criterion variables influenced by PA (e.g., financial acceptance). The three subdimensions included in this study were physical QoL (5 items), psychological QoL (6 items), moods and emotions QoL (7 items).

Participants were asked first to read a brief instruction on the top of the measure. Then, they were instructed to mark their answer on a 5-point Likert scale among the multiple choices ranging from never, seldom, sometimes, often, to always. The first item of the physical QoL dimension asks general health. All of the items except for the first item of the physical QoL dimension needed to be answered, based on the phrase, "Thinking about the last week...". The following illustrates example items of the dimensions: physical QoL (e.g., "Have you felt fit and well?"), psychological QoL (e.g., "Has your life been enjoyable?") and moods and emotions QoL (e.g., "Have you felt lonely?"). Scores were calculated by summing the scores of each subscale. Some items were reverse-coded. Following the Rasch model, the total scores of each subscale were transformed to Rasch scores and then T-value scores. T-value scores have a mean of 50 and a standard deviation of 10, with higher scores reflecting higher QoL for each dimension.

KIDSCREEN-10

The KIDSCREEN-10 is a short version of the KIDSCREEN instruments designed to assess children's and adolescents' global QoL (Ravens-Sieberer et al., 2010; The KIDSCREEN Group Europe, 2016). The KIDSCREEN-10 consists of 10 items. Like the KIDSCREEN-52, the KIDSCREEN-10 was measured on a 5-point Likert scale ranging from never to always. T-value scores were estimated based on the Rasch model for statistical analyses.

Statistical Analysis

Descriptive analyses of the variables of interest were performed first for the full sample and each gender. Physical activities participants currently practiced and the number of days for MVPA were examined. Also, internal consistency was examined to determine the reliability of the scales. It was expected that instruments used in this study would demonstrate satisfactory Cronbach's Alpha. A Shapiro-Wilk's test (Shapiro & Wilk, 1965) was performed to examine a normal distribution. Further, skewness, kurtosis, normal Q-Q plots, and box plots for both genders were inspected. A Levene's test was performed to investigate equality of variances. Then, independent samples t-tests were performed to examine whether PA, PSW, and global, physical, psychological, and emotions and moods QoL differed between girls and boys.

Pearson's product moment correlation analyses among PA, PSW, subdomains of QoL, and global QoL were carried out for the full sample and then for each gender. It was hypothesized that PA would be significantly related to PSW, subdomains of QoL and global QoL and that PSW would be related to subdomains of QoL and global QoL.

Ordinary least squares (OLS) regression-based path analyses were performed, using the Hayes (2013) PROCESS macro embedded in the SPSS to test mediation and moderated mediation models (See Figure 1 and 2). Mean centered PA and PSW values were used instead of raw scores to improve interpretability of the results of path coefficients. In addition, gender was coded to -.5 for boys and +.5 for girls instead of a typical dummy coding (e.g., 0 for boys and 1 for girls). This contrast coding allowed for analyzing unweighted average effects of independent variables (e.g., PA) on dependent

variables (e.g., global QoL) across the level of moderator (e.g., gender). A bias-corrected bootstrap standard confidence interval was used to determine the significance of the indirect effect and conditional indirect effect (i.e., effect of moderated mediation). The number of bootstrap samples was 10,000. The effects were considered significant when zero was not straddled between the upper and lower 95% confidence interval.

In proposed mediation models, PA was entered as an independent variable and PSW as a single mediator. Four dependent variables in the model included global QoL, physical QoL, psychological QoL, and moods and emotions QoL. Therefore, four mediation models were performed. It was hypothesized that PA would be directly associated with PSW, which in turn would be associated with subdomains of QoL and global QoL. It was expected that higher PA would be associated with higher PSW and higher PSW would be subsequently associated with higher QoL scores.

Additionally, moderated mediation models were tested. In proposed moderated mediation models, gender was entered as a moderator of the path from PA to PSW and the path from PSW to QoL, with PA as an independent variable, PSW as a mediator, and QoL variables as dependent variables. Therefore, four moderated mediation models were performed. It was hypothesized that the effect of PA on PSW would be moderated by gender. Regarding a moderating effect of gender on the path from PSW to QoL variables, no specific hypothesis was made. It was also hypothesized that the indirect effect of PA on QoL variables via PSW would be contingent on gender. The degree of indirect effect of PA on QoL through PSW would be greater for boys than girls. Adjusted *p* values were adopted, using the Bonferroni method. Bonferroni adjusted *p* values prevent the chance

of committing Type I error (i.e., falsely rejecting a null hypothesis when there is no real effect). Because there were six dependent variables for independent samples t-tests, an alpha level of .0083 was used by dividing a typical alpha level of .05 by 6. For mediation and moderated mediation analyses, four dependent variables were tested and thus an alpha level of .0125 was used. All statistical analyses of this study were performed, using IBM SPSS Statistics and Microsoft Excel.

CHAPTER IV

RESULTS

This chapter provides results of the descriptive analysis, independent samples t-tests, correlation analyses, and multiple regression path analyses testing mediation and moderated mediation models. The primary objective of this study was to examine the role of physical self-worth (PSW) in the relationship between physical activity (PA) and quality of life (QoL). Furthermore, it was examined whether gender functions as a moderator of these relationships. Specifically, it was hypothesized that PA would be associated with PSW, and in turn would be associated with global and subdimensions of quality of life (QoL). Thus, direct and indirect effects of PA on QoL variables were examined. It was further hypothesized that gender would moderate the path from PA to PSW. The path from PSW to QoL was explored, but no specific hypothesis was generated. It was expected that there would be greater indirect effects of PA on QoL dimensions via PSW for boys relative to girls. Descriptive analyses and independent samples t-tests were conducted to provide demographic information on the sample. Primary and secondary physical activities participants currently practiced were reported as frequencies and percentages. Also, the effects of gender on variables of interest were examined. It was predicted that girls would have lower scores on the variables relative to boys. Alpha levels were adjusted based on the Bonferroni method due to multiple comparisons. For the independent samples t-tests, an alpha level of .0083 was used.

When mediation and moderated mediation analyses were conducted, an alpha level of .0125 was used to determine significance of the results with an alpha level falling between .0125 and .05 noted.

Sample Characteristics

First graders and third graders from one public middle school (a middle school first grader in the Korean educational system is equivalent to a seventh grader in the U.S. educational system; a middle school third grader in the Korean educational system is equivalent to a ninth grader in the U.S. educational system) located in Seoul, Korea, participated in this study. A total of 310 students volunteered to participate (boys = 139, 58.9%; girls = 97, 41.1%; middle school first grade = 127, 53.8%; middle school third grade = 109, 46.2%). The average age of students was 13.92 (*SD* = 1.06, range = 12-16). However, due to incomplete responses (e.g., more than 2 items for each scale) and incomplete questionnaires (e.g., scoring 3 for all of the items), data from 73 students were excluded from this study. In addition, data from one student with cognitive impairment was further excluded. Altogether, 236 out of 310 were used for the analyses.

The most often practiced physical activities and other physical activities showed some similar and different trends across genders. The most often practiced physical activity for boys was soccer, followed by basketball, walking, bodyweight exercise, and badminton. More than 20% of girls chose walking as a type of physical activity they participated in most frequently. If walking to school is included in the walking category, about 35% of girls regarded their primary physical activity as walking. Girls also

frequently practiced basketball, running and dance. Both girls and boys performed walking, badminton and running. Other physical activities students performed showed a similar trend to that of the primary physical activity. That is, both girls and boys participated in walking, running and badminton as their primary and secondary physical activities. However, boys participated more in contact sports (e.g., soccer) and bodyweight exercise such as push-ups and sit-ups, whereas dance emerged as one of the unique physical activities girls performed. Full details are presented in Appendix.

Additionally, the number of days participants were physically active was examined. First, the number of participants who met the recommended PA guidelines (i.e., accumulation of at least 60 minutes of moderate to vigorous PA everyday) was examined. Only 32 out of 236 students (13.6%) were physically active for a minimum of 60 minutes daily during the last week; 29 out of 236 participants (12.3%) were physically active for a minimum of 60 minutes daily during the typical week.; 28 participants (11.9%) met the recommended PA guidelines both during the past week and typical week; 28 participants (11.9%) did not participate in any PA during the past week and typical week. The other participants (approximately 70% of students of the sample) fell in between no PA and the recommended PA level.

For further description of sample characteristics by gender, independent samples t-tests were performed. The assumptions of the independent samples t-test were examined first. The assumption of the normal distribution of the data was tested, using a Shapiro-Wilk's test (Shapiro & Wilk, 1965) and inspecting skewness, kurtosis, normal Q-Q plots, and box plots for both girls and boys. Although results of a Shapiro-Wilk's test indicated

that data might not be normally distributed ($p < .001$), the values of skewness and kurtosis for all of the scales were below an absolute value of 2, one of the indicators of a normal univariate distribution (Gravetter, & Wallnau, 2014). The z-scores of skewness and kurtosis were also below an absolute value of 1.96, which indicates normality of the data (Cramer, 1998). A visual inspection of normal Q-Q plots and box plots were indicative of an approximate normal distribution for both girls and boys. The rationale of relying less on the results of a Shapiro-Wilk's test is that when data consist of multiple tie scores due to grouping or rounding, the results may not be suitable for testing normality (Pearson, D'Agostino, & Bowman, 1977). Homogeneity of variances was also examined using a Levene's test. Results of the Levene's test revealed that the error term had approximately constant variance across genders for all of the scales used in this study ($p > .01$).

The independent samples t-tests were conducted to examine if there were differences in PA, PSW, global, physical, psychological, and emotions and moods QoL between girls and boys. Results of the independent samples t-tests revealed that there were significant differences between girls and boys in PA scores, $t(234) = 2.69$, $p < .008$, $d = .36$, $\eta^2 = .03$, in PSW, $t(234) = 3.19$, $p < .008$, $d = .42$, $\eta^2 = .04$, in global QoL, $t(234) = 3.14$, $p < .008$, $d = .42$, $\eta^2 = .04$, in physical QoL, $t(234) = 4.33$, $p < .001$, $d = .58$, $\eta^2 = .07$, in psychological QoL, $t(234) = 3.85$, $p < .001$, $d = .51$, $\eta^2 = .06$, and in and emotions and moods QoL, $t(234) = 3.04$, $p < .008$, $d = .40$, $\eta^2 = 04$. These results showed that boys had significantly higher scores on all of the scales compared to girls (see Table 1). The difference in physical QoL between genders was

Table 1

Results of Independent Samples t-test Descriptive Statistics for Variables of Interest by Students Gender

Variables	Gender				Full sample							
	Boys(n = 139)		Girls(n = 97)		(n = 236)						*n of*	
	M	*SD*	*M*	*SD*	*M*	*SD*	*t*	*d*	η^2	Range	*items*	α
Days for PA	3.53	2.26	2.75	2.13	3.21	2.23	2.69*	.36	.03	0 – 7	2	.95
PSW	16.19	4.41	14.33	4.37	15.42	4.47	3.19*	.42	.04	7– 24	6	.81
Global QoL	54.27	15.99	47.83	14.73	51.62	15.77	3.14*	.42	.04	27–52	10	.90
Physical QoL	49.49	13.19	42.27	11.72	46.52	13.07	4.33**	.58	.07	12 – 73	5	.91
Psychological QoL	51.58	13.05	45.07	13.67	49.06	13.70	3.85**	.51	.06	10–68	6	.95
Moods and Emotions QoL	50.51	13.09	45.22	13.24	48.33	13.38	3.04*	.40	.04	8–48	7	.90

Note: PA: physical activity. PSW: physical self-worth. QoL: quality of life.
*p< .008; **p< .001

largest with boys scoring the average of 49.49 (*SD* = 13.19) and girls scoring the average of 42.27 (*SD* = 11.72). According to Cohen's (1988) suggestion for interpretation of effect size, the effect sizes for PA scores, PSW, global QoL, and emotions and moods QoL were small to moderate (i.e., *d* is greater than .2). As for physical and psychological QoL, the effect sizes for gender were moderate (i.e., *d* is greater than .5).

Reliabilities

Reliabilities of all scales (the PACE+ Adolescent Physical Activity Measure [PACE+], the Children and Youth Physical Self-Worth Scale [CY-PSWS], KIDSCREEN-10, and selective subscales of KIDSCREEN-52: physical QoL, psychological QoL, and moods and emotions QoL) were analyzed (see Table 1). The PACE+ consisting of two items showed high reliability (α = .95). The CY-PSWS consisting of six items also demonstrated satisfactory reliability (α = .81). Cronbach's Alpha coefficients of the KISCREEN measures were greater than .90 (for KISCREEN-10 global QoL, α = .91; for KISCREEN-52 physical QoL subscale, α = .91; for KISCREEN-52 psychological QoL subscale, α = .95; for KISCREEN-52 moods and emotions QoL subscale, α = .90). All of the scales used in this study demonstrated great reliability scores.

Correlations

Pearson's product moment correlation analysis was performed to determine the correlations among PA, PSW, global, physical, psychological, and moods and emotions

QoL. Results of the correlation analysis revealed that all of the variables were positively correlated (see Table 2). PA was positively correlated with PSW and all of the QoL scales. PA was strongly correlated with physical QoL (i.e., *r* greater than .5). PA was moderately correlated with PSW and psychological QoL (i.e., *r* greater than .3). PA had significant yet weak correlations with global QoL and moods and emotions QoL (i.e., *r* greater than .1). In addition, strength of the bivariate relationship between PSW and physical QoL was large (i.e., *r* greater than .5). The correlation of PSW with global QoL and psychological QoL was moderate to large. PSW was moderately correlated with moods and emotions QoL. All of variables in this study were significantly correlated and the direction of the correlations was positive. Effect sizes for most correlation coefficients were moderate to large. Correlations for each gender were performed. For both genders, PA was positively correlated to all of the variables except for moods and emotions QoL for boys (see Table 3 and 4). The correlation between physical QoL and moods and emotions QoL for boys was not significant. PSW was positively correlated with QoL variables for both girls and boys.

Variable Rescaling

PA and PSW scores were mean-centered whereas gender was coded using contrast coding (boys: -.5, girls: +.5) as suggested by Hayes (2013). Mean centering of PA and PSW was used to allow for a meaningful interpretation of path coefficients; specifically, zero is outside of the range of PSW scale, which makes it difficult to interpret path coefficients when PSW is coded as zero, using dummy coding (path b_2 in

Table 2

Results of Pearson's Product Moment Correlations for Variables of Interest (n = 236)

Variables	1	2	3	4	5	6
1. Days for PA						
2. PSW	.38***					
3. Global QoL	.27***	.41***				
4. Physical QoL	.53***	.55***	.56***			
5. Psychological QoL	.36***	.46***	.80***	.63***		
6. Moods and Emotions QoL	.14**	.34***	.59***	.25***	.54***	

Note: PA: physical activity. PSW: physical self-worth. QoL: quality of life.
*p< .05; **p< .01; ***p< .001.

Table 3

Results of Pearson's Product Moment Correlations for Variables of Interest among Girls (n = 97)

Variables	1	2	3	4	5	6
1. Days for PA						
2. PSW	.27**					
3. Global QoL	.30**	.39**				
4. Physical QoL	.49**	.44**	.67**			
5. Psychological QoL	.31**	.44**	.85**	.63**		
6. Moods and Emotions QoL	.10	.38**	.66**	.35**	.66**	

Note: PA: physical activity. PSW: physical self-worth. QoL: quality of life.
*p< .05; **p< .01

Table 4

Results of Pearson's Product Moment Correlations for Variables of Interest among Boys (n = 139)

Variables	1	2	3	4	5	6
1. Days for PA						
2. PSW	.42**					
3. Global QoL	.21*	.38**				
4. Physical QoL	.51**	.58**	.46**			
5. Psychological QoL	.35**	.43**	.75**	.59**		
6. Moods and Emotions QoL	.11	.27**	.52**	.13	.41**	

Note: PA: physical activity. PSW: physical self-worth. QoL: quality of life.
*$p < .05$; **$p < .01$

Figure 7). In addition, it may be more informative to report the path coefficients when PA and PSW scores are averaged than being zero. In addition, because gender was coded to -.5 for boys and +.5 for girls, unweighted average effects of PA and PSW across gender were analyzed, as opposed to arbitrarily selecting either gender as a reference group.

Mediation

Four mediation models were tested using Hayes' (2013) Process Macro. In these models, PA was entered as an independent variable with PSW as a mediator. Dependent variables included global, physical, psychological, and emotions and moods QoL. Each dependent variable was entered in each model with the same independent and mediator variables (see Figure 3 – 6). Table 5 presents regression coefficients, standard errors, *t* values, *p* values, and an upper and lower bound of 95% confidence interval. It was hypothesized that PA would be associated with PSW, which would be further associated with all QoL variables. For all mediation models tested in this study, the path from PA to PSW was significant (all *p* values <.001). PSW was significantly associated with all QoL variables, controlling for PA (all *p* values <.001). The direct effect of PA on physical QoL and psychological QoL was still significant after holding PSW constant. The effect of PA on global QoL and moods and emotions QoL became non-significant, holding PSW constant. Specifically, the alpha level of the effect of PA on PSW after accounting for PSW was less than .05, but not less than the adjusted alpha level, .0125. This result indicates that PSW fully mediated the relationship between PA and global QoL and between PA and moods and emotions, whereas PSW partially mediated the association

between PA and the other QoL domains. Statistical mediation path models with regression coefficients are shown in Figure 3 – 6 (Model 1 – 4). A bias-corrected bootstrap confidence interval (*n* of bootstrap samples: 10,000) was estimated to determine significance of indirect effects of each model. As presented in Table 6, a bias-corrected bootstrap confidence interval was statistically different from zero, which revealed that the indirect effect of PA on each dependent variable via PSW was significant.

Table 5

Results of Mediation Analysis for Variables of Interest (Model 1 – 4)

Mediator					
	Dependent variable: PSW				
Predictor	*B*	*SE*	*t*	*p*	95% CI
PA	.76	.12	6.30	<.001	[.525, 1.003]
Model 1	Dependent variable: Global QoL				
	B	*SE*	*t*	*p*	95% CI
PSW	1.27	.23	5.61	<.001	[.822, 1.711]
PA	.92	.45	2.03	>.013	[.025, 1.809]
Model 2					
	Dependent variable: Physical QoL				
	B	*SE*	*t*	*p*	95% CI
PSW	1.20	.16	7.63	<.001	[.890, 1.510]
PA	2.17	.32	6.88	<.001	[1.546, 2.789]
Model 3					
	Dependent variable: Psychological QoL				
	B	*SE*	*t*	*p*	95% CI
PSW	1.17	.19	6.23	<.001	[.797, 1.534]
PA	1.32	.38	3.52	<.001	[.581, 2.060]
Model 4					
	Dependent variable: Emotion and moods QoL				
	B	*SE*	*t*	*p*	95% CI
PSW	1.01	.20	5.06	<.001	[.614, 1.398]
PA	.05	.40	.14	>.05	[-.732, .841]

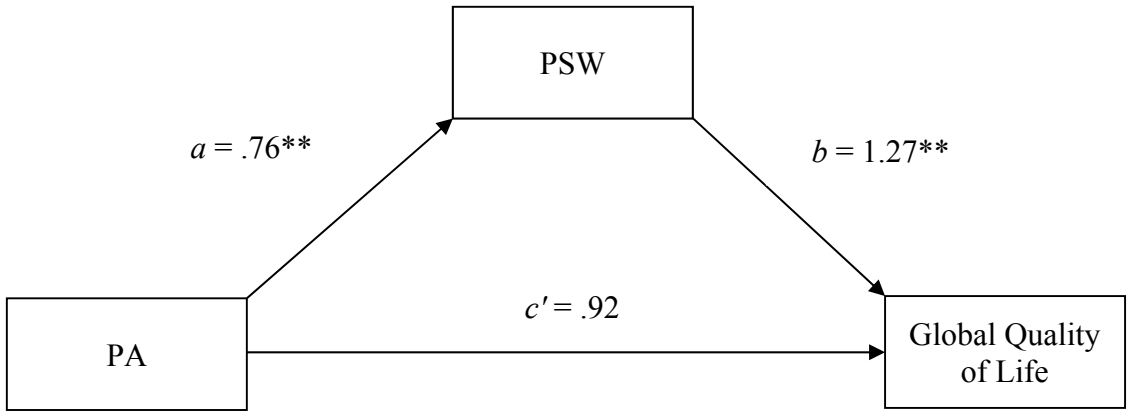
Table 6

Bootstrapping Results of Indirect Effects (Model 1 – 4)

Dependent variables	Effect	*SE*	95% CI
Model 1: Global QoL	.97	.24	[.653, .094]
Model 2: Physical QoL	.92	.19	[.591, 1.336]
Model 3: Psychological QoL	.89	.21	[.529, 1.377]
Model 4: Emotion and moods	.77	.20	[.427, 1.225]

Figure 3

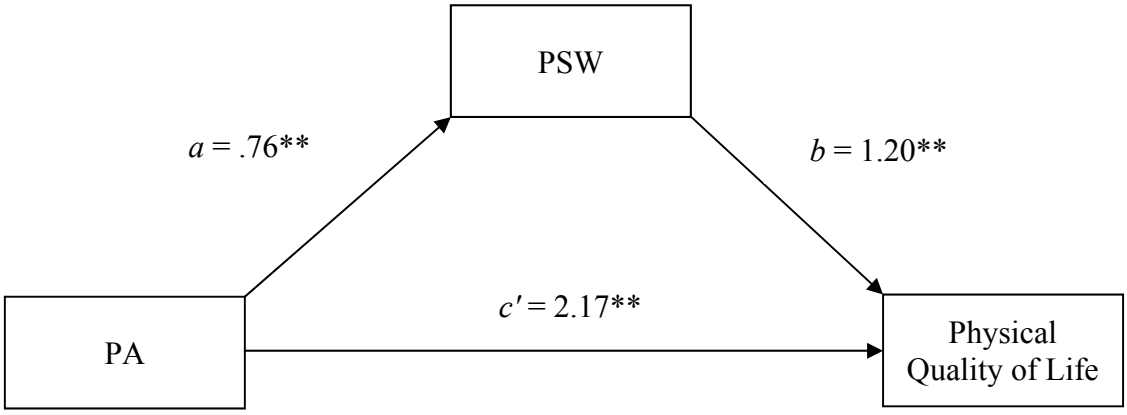
A Diagram of the Statistical Mediation Path Model (DV: Global Quality of Life)



Note: **p < .01

Figure 4

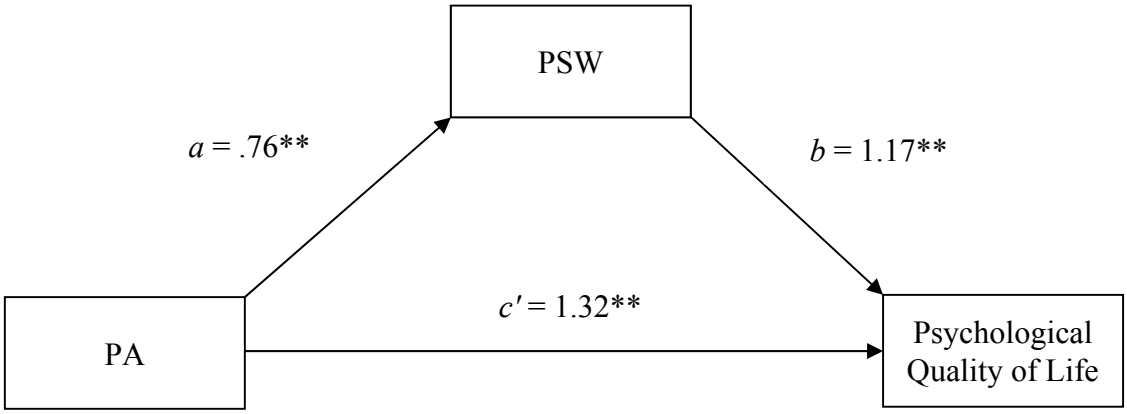
A Diagram of the Statistical Mediation Path Model (DV: Physical Quality of Life)



Note: * *p < .01

Figure 5

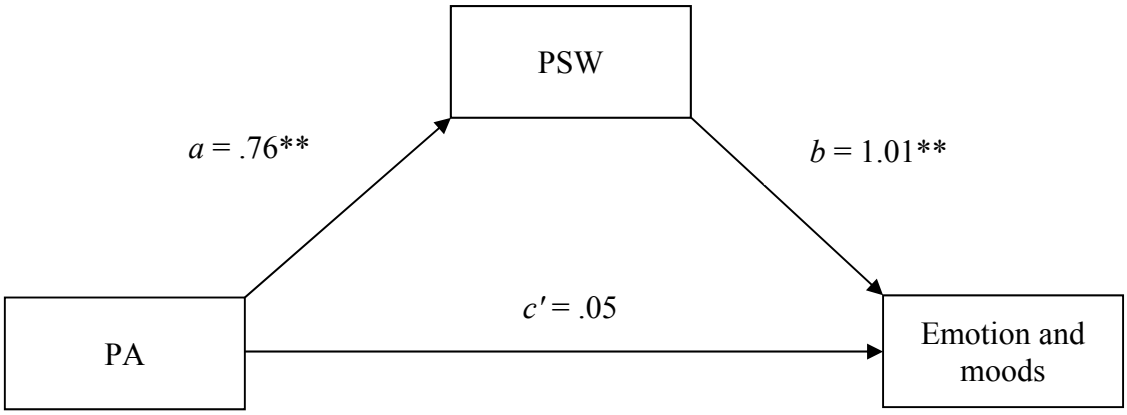
A Diagram of the Statistical Mediation Path Model (DV: Psychological Quality of Life)



Note: **p < .01

Figure 6

A Diagram of the Statistical Mediation Path Model (DV: Moods and Emotions Quality of Life)



Note: **p < .01

Moderated Mediation

Four moderated mediation models were tested to determine the conditional indirect effect of PA on dependent variables (global QoL, physical QoL, psychological QoL, and emotions and moods QoL) via PSW. The moderating effect of gender on the path from PA and PSW and the path from PSW to QoL variables was proposed in the model. It was hypothesized that the degree of the indirect effect would differ across genders. Statistical path models can be found in Figure 7 – 10 (Model 5 – 8).

Regression coefficients, standard errors, *t* values, *p* values, and upper and lower bound of 95% confidence intervals for four moderated mediation models are presented in Table 7. The unweighted average effect of PA on PSW across gender was statistically significant, $p < .001$ (see path a_1 in Figure 7 – 10). The effect of gender on PSW with an average PA score was not statistically significant, $p > .0125$ (see path a_2 in Figure 7 – 10).

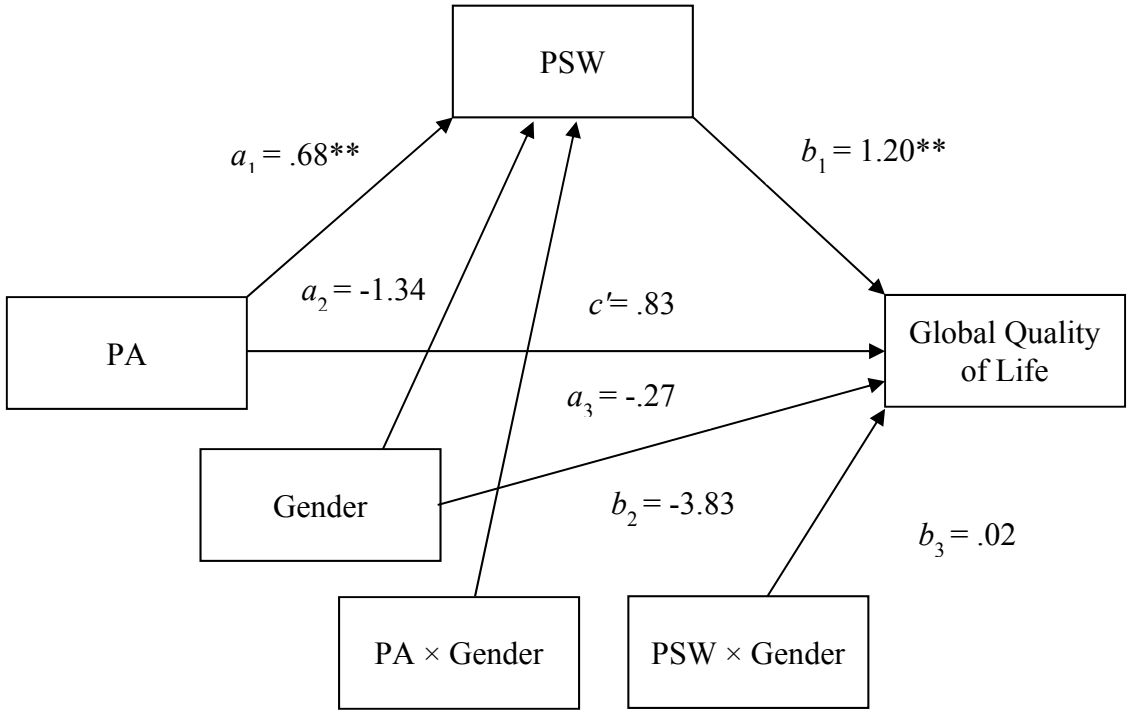
Given the negative value of the regression coefficient, there was a trend that girls at the average PA level had lower PSW relative to boys at the average PA level. Although the *p* value was less than .05, it was not less than the adjusted alpha level, .0125. Such results indicated that the difference in PSW between girls and boys at the average physical activity level was not statistically significant at the adjusted alpha level. In addition, PA × Gender (see path a_3 in Figure 7 – 10) was not statistically significant ($p > .05$). When global QoL was entered as a dependent variable in Model 5, the unweighted average effect of PSW on global QoL across gender was statistically significant holding PA constant; however, none of the other predictors were associated with global QoL. More specifically, PA was not related to global QoL after controlling for PSW. Gender was not associated with global QoL when PSW was averaged. PSW × Gender was not associated with global QoL. Similar trends were found in Model 6 – 8 with subdomains of QoL. For Model 6 and 7, PA was still significantly associated to physical and psychological QoL after controlling for PSW. Gender was not significantly associated with QoL variables when PSW was averaged. Girls and boys who had an average PSW score did not statistically differ in QoL scores.

A bias-corrected bootstrap method was used to confirm a conditional indirect effect of each model (see Table 8). Results of a bias-corrected bootstrap confidence interval revealed that the indirect effect of PA on each dependent variable via PSW was not contingent on gender. A bootstrapped confidence interval included zero, indicating that none of the conditional indirect effects were significant. Negative values suggested that there was a trend in which the indirect effect was stronger for boys than girls, but not

at the statistical significance level. That is, the indirect effect of PA on global, physical, psychological and emotion and moods QoL through PSW was significant for both girls and boys.

Figure 7

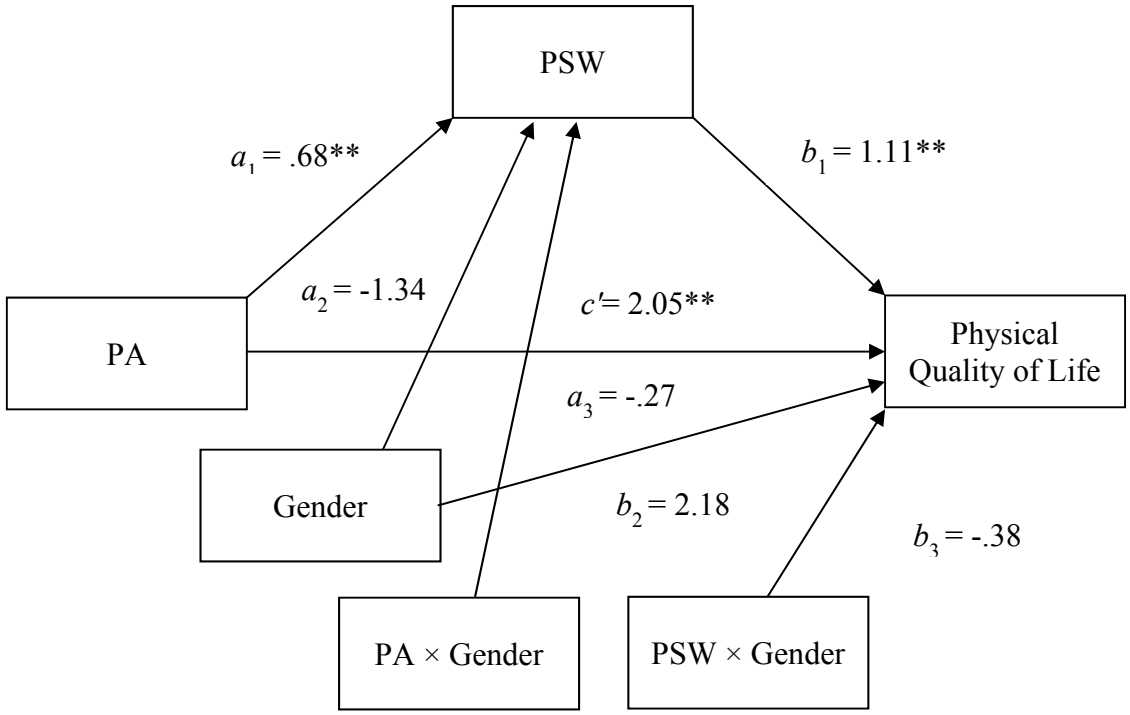
A Diagram of the Statistical Moderated Mediation Path Model (DV: Global Quality of Life)



Note: **p < .01

Figure 8

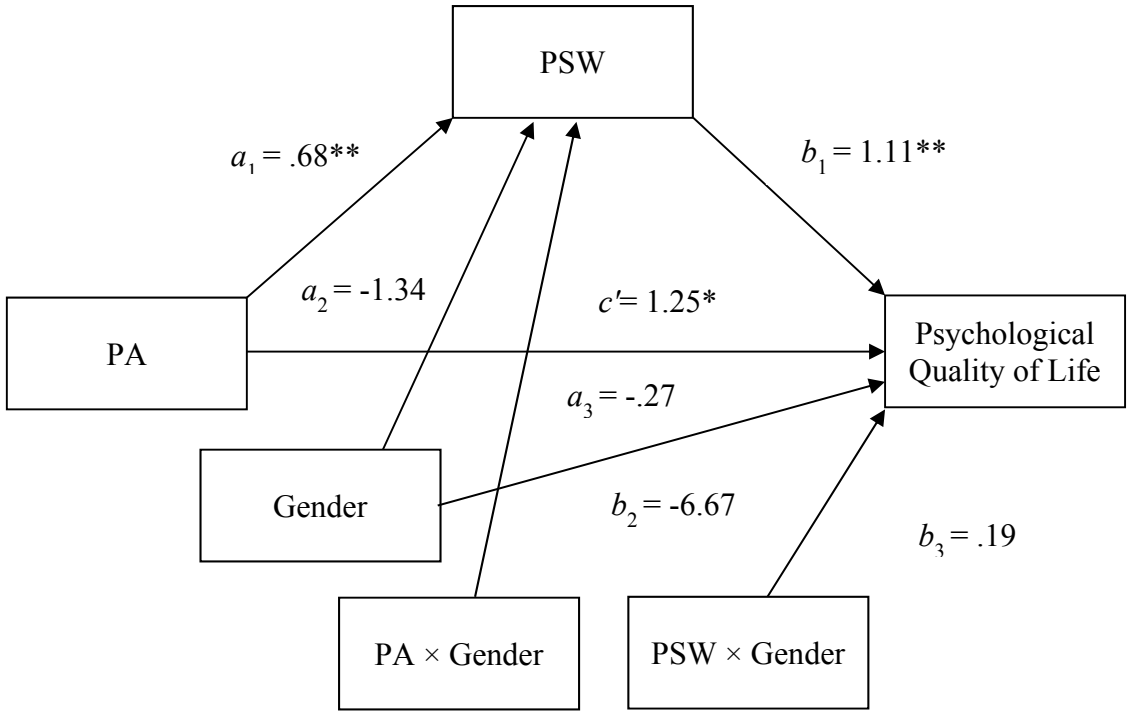
A Diagram of the Statistical Moderated Mediation Path Model (DV: Physical Quality of Life)



Note: **p < .01

Figure 9

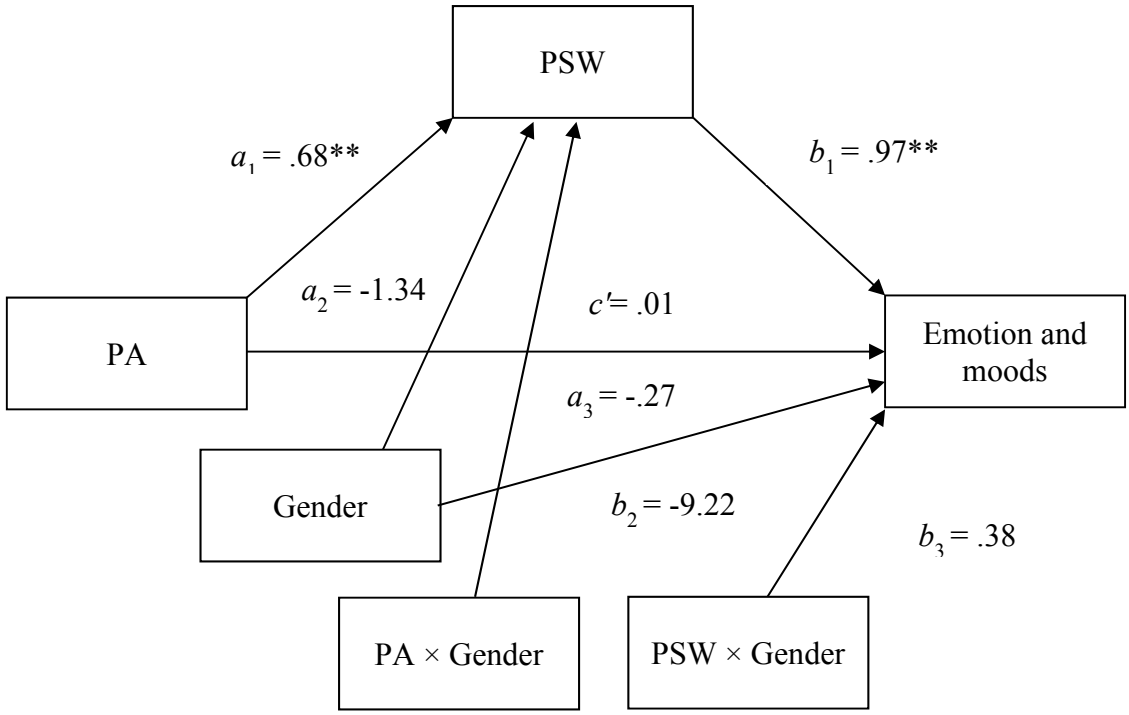
A Diagram of the Statistical Moderated Mediation Path Model (DV: Psychological Quality of Life)



Note: **p < .01

Figure 10

A Diagram of the Statistical Moderated Mediation Path Model (DV: Moods and Emotions Quality of Life)



Note: **p < .01

Table 7

Results of Moderated Mediation Analysis for Variables of Interest (Model 5 – 8)

Mediator					
	Dependent variable: PSW				
Predictor	*B*	*SE*	*t*	*p*	95% CI
PA	.68	.13	5.44	<.001	[.435, .929]
Gender	-1.34	.55	-2.42	<.05	[-2.432, -.250]
PA × Gender	-.27	.25	-1.09	>.013	[-.767, .221]
Model 5	Dependent variable: Global QoL				
	B	*SE*	*t*	*p*	95% CI
PSW	1.20	.23	5.23	<.001	[.751, 1.658]
PA	.83	.46	1.82	>.05	[-.067, 1.729]
Gender	-3.83	6.82	-.56	>.05	[-17.27, 9.610]
PSW × Gender	.02	.43	.04	>.05	[-.838, .875]
Model 6					
	Dependent variable: Physical QoL				
	B	*SE*	*t*	*p*	95% CI
PSW	1.11	.16	6.99	<.001	[.796, 1.421]
PA	2.05	.31	6.52	<.001	[1.428, 2.666]
Gender	2.18	4.70	.46	>.05	[-7.080, 11.447]
PSW × Gender	-.38	.30	-1.25	>.05	[-.966, .215]
Model 7					
	Dependent variable: Psychological QoL				
	B	*SE*	*t*	*p*	95% CI
PSW	1.11	.19	5.86	<.001	[.739, 1.488]
PA	1.25	.38	3.31	<.01	[.505, 1.986]
Gender	-6.67	5.62	-1.19	>.05	[-17.753, -4.112]
PSW × Gender	.19	.36	.54	>.05	[-.514, .899]
Model 8					
	Dependent variable: Emotion and moods QoL				
	B	*SE*	*t*	*p*	95% CI
PSW	.97	.20	4.81	<.001	[.574, 1.371]
PA	.01	.40	.01	>.05	[-.787, .790]
Gender	-9.22	5.99	-1.54	>.05	[-21.018, -2.579]
PSW × Gender	.38	.38	.98	>.05	[-.376, 1.128]

Table 8

Bootstrapping Results of Conditional Indirect Effects (Model 5 – 8)

Dependent variables	Effect	*SE*	95% CI
Model 5: Global QoL	-.32	.46	[-1.163, .648]
Model 6: Physical QoL	-.56	.35	[-1.223, .161]
Model 7: Psychological QoL	-.17	.40	[-.943, .611]
Model 8: Emotion and moods	-.01	.38	[-.730, .745]

Summary of Results

In this chapter, descriptive analysis and independent t-tests were conducted to describe the sample characteristics. Current physical activities, number of days for MVPA and the effect of gender on the variables of interest were reported. Girls and boys participated in many similar activities, but boys participated in soccer most often whereas more than one-third of the girls participated in walking. The number of students who met the recommended PA guidelines was low, whereas the number of students who were physically inactive was high. PA, PSW, global, physical, psychological, and emotions and moods QoL differed across genders. Boys had higher scores on all of the variables than girls.

Results of mediation models showed that PA was associated with PSW, and in turn, PSW was related to global, physical, psychological, and emotions and moods QoL. Physically active adolescents reported higher PSW and higher perceptions of global and subdimensions of QoL. In particular, PA was directly associated with physical QoL and psychological QoL after controlling for PSW. Results of moderated mediation models

demonstrated that although there was a trend for boys to have greater effect of PA on PSW and greater effect of PSW on QoL domains, the moderating effect of gender was not statistically significant. The indirect effect of PA on QoL domains via PSW was significant for both girls and boys. That is, more days for PA led to higher PSW, and in turn higher PSW contributed to higher QoL profiles similarly for girls and boys.

CHAPTER V

DISCUSSION

The primary purpose of the present study was to investigate the mediating role of physical self-worth (PSW) and moderating role of gender on the relationship between physical activity (PA) and quality of life (QoL) in adolescents. Specifically, it was examined whether PA leads to PSW, which in turn contributes to global and subdimensions of QoL. Furthermore, the moderating role of gender was examined by analyzing the conditional indirect effect.

Sample Characteristics

Preliminary analyses were conducted first to provide a detailed description of participants in this study. Sample characteristics were described in terms of types of PA participants engaged in and days participants were physically active. Girls and boys participated in different types of PA. While girls' primary PA was walking, boys performed more intensive sports such as soccer, basketball and bodyweight exercise. There were some similar PA types reported by both groups. Both girls and boys frequently practiced walking, badminton, and running. Secondary physical activities showed a similar trend for both genders.

The results of frequency analysis of days for PA for the full sample revealed that the proportion of students who were physically active for at least 60 minutes everyday

was very low; 28 out of 236 participants (11.9%) participated in moderate to vigorous physical activity (MVPA) for the minimum of 60 minutes everyday. The same number of participants (n = 28) did not participate in PA for a single day during the past week and typical week. This PA participation rate is quite alarming, because the proportion of PA participation for this sample is much smaller than what has been reported in the previous studies. Approximately 15 - 23 % of children and adolescents across multiple countries practiced daily MVPA (Currie et al., 2009). According to Korea CDC (2017), 16.7% of middle school-aged adolescents performed moderate PA for at least 60 minutes a day for more than five days a week whereas 45.5% performed vigorous PA for at least 60 minutes a day for more than three days a week. In this study 31.4 % of participants participated in PA more than five days a week. The measure in this study combined moderate and vigorous PA intensity, which makes it difficult to compare the findings directly. It is evident that most participants in this study only practiced some amount of PA (e.g., more than one day but less than seven days a week), but not enough to meet international/ U.S. recommended PA guidelines. That is, most participants were somewhat physically active, but not enough to bring physical health benefits based on international PA standards.

Results revealed that there were substantial differences in PA, PSW, and QoL variables between genders. Consistent with the literature (Caspersen et al., 2000; Korea CDC, 2017; Song, Carroll, & Fulton, 2013; Telama & Yang, 2000), girls participated in PA for less days than boys. PSW differed between genders. Specifically, girls reported lower PSW than boys, which is supportive of the findings of previous research (Asci,

2002; Fox & Corbin, 1989; Hagger, Ashford, & Stambulova, 1998; Sonstroem et al., 1992; Whitehead, 1995). Finally, for all of the QoL scales (e.g., global, physical, psychological, and emotions and moods QoL), girls reported lower QoL scores relative to boys. This finding supports previous research that revealed lower QoL for girls, compared to boys (Bisegger et al., 2005; Michel, Bisegger, Fuhr, & Abel, 2009; Swallen, Reither, Haas, & Meier, 2005). It is important to note that the effect size was largest for physical QoL in this study. Such large differences in PA, PSW and QoL between girls and boys necessitate future studies exploring factors that explain girls' higher prevalence of physical inactivity as well as lower perceptions of PSW and QoL. A few studies suggested that there are multiple potential factors contributing to gender differences. Environmental, developmental, and psychosocial differences between genders have been recognized as leading determinants (Garcia et al., 1995; Trost et al., 1996). Future intervention programs should center around developing strategies specifically designed for girls based on previous studies.

Mediation

The major findings of the present study were significant indirect effects of PA on QoL variables via PSW. Results of mediation models indicated that the path from PA to PSW and the path from PSW to QoL variables were statistically significant. That is, PA was directly correlated with PSW in the model. Also, PSW was directly associated with QoL after controlling PA. Interestingly, PA was directly associated with physical and psychological QoL after accounting for PSW. For the mediation models with physical

and psychological QoL as dependent variables, PSW partially mediated the relationship between PA and physical QoL, and between PA and psychological QoL. That is, PA had direct effects and indirect effects on physical QoL and psychological QoL through PSW. It is possible that there may be potential mediators other than PSW that link PA to physical QoL and psychological QoL. When mediation models were analyzed with global QoL and emotions and moods QoL as dependent variables, PSW fully mediated the relationship. Specifically, PSW was an important factor that acted as a link from PA to global QoL and emotions and moods QoL. It should be noted that the Bonferroni method was used to adjust an alpha level and therefore the chance to reject the null hypothesis was narrower. The direct effect of PA on global QoL was not significant at the adjusted alpha level. Therefore, the full mediation with global QoL as a dependent variable should be interpreted with caution.

The key finding of the mediation analysis was the mediating effects of PSW on all of the QoL variables. Results indicate that more days for MVPA were associated with higher perceptions of PSW, and in turn were associated with higher global, physical, psychological, and emotions and moods QoL. In other words, adolescents who were physically active for at least 60 minutes a day reported better PSW and those who reported better PSW perceived greater QoL. Such findings align with the PA and QoL research in different age groups such as older adults (McAuley et al., 2006) and young adults (Joseph et al., 2014). In particular, Joseph et al. (2014) found that physical self-worth was the most important mediating factor between PA and global QoL in young people. The findings of the full mediation models support the proposition that the effect

of PA on QoL is often mediated by more readily modifiable, proximal, and temporarily sensitive mediating variables such as self-efficacy and self-worth (McAuley & Morris, 2007; McAuley et al., 2008).

Moderated Mediation

Results of moderated mediation models revealed that the unweighted average PA across genders was associated with PSW. However, gender was not a significant predictor of PSW at the average PA. The interaction term (PA × Gender) was not significantly associated with PSW. Such results indicate that regardless of gender, higher PA led to higher perceptions of PSW. Although girls tended to report lower PSW relative to boys when PA was averaged, gender was not a significant predictor. The effect of PA on PSW was not conditional on gender in the model.

Regarding the path from PSW to QoL variables, unweighted average PSW across genders was significantly associated with QoL variables. Similar to mediation models, PA was associated with physical QoL and psychological QoL after accounting for PSW. Gender was not related to QoL variables when PSW was averaged. Furthermore, the interaction term (PSW × Gender) was not associated with QoL variables. These results showed that regardless of gender, higher PSW resulted in higher QoL variables. Girls and boys did not differentially perceive QoL domains when PSW was averaged. The effect of PSW on QoL variables was not dependent on gender in the model.

Obviously, gender did not significantly moderate either path from PA to PSW or the path from PSW to QoL variables. No conditional indirect effect was present.

Relatively weaker indirect effects were found in girls compared to boys, but the difference was not significant. The mediating effect of PSW on the relationship between PA and QoL domains was not dependent on gender. That is, when both girls and boys are physically active, they similarly perceived higher PSW, and in turn experienced higher QoL. Although these findings are in contrast to the hypothesis and the findings from previous research (Babic et al., 2014), they have important implications. The indirect effect of PA applies not only to boys, but also to girls. Although girls often perform less PA than boys, girls can improve QoL through PSW when they become physically active.

Given limited evidence, it is difficult to explain why gender was not a significant moderator of the association between PA and QoL and between PSW and QoL. A possible explanation for the non-significant moderating effect of gender may be that gender moderates the association between PA and other self-related constructs. For example, Hayes et al. (1999) reported that PA was related to all subdimensions of PSW for men, whereas physical conditioning was only associated with PSW for women. Their findings indicate that the gender moderates the effect of PA on subdimensions of QoL (e.g., sport competence, body attractiveness, and physical strength). Another possible moderation model involves global self-worth. Haugen et al. (2011) found a moderating effect of gender on the indirect effect of PA on global self-worth via body satisfaction and physical appearance. It may seem that moderation may exist at the subdomain level or global level, but not at the domain level. Future investigations should explore conditional indirect effect by including subdimensions of PSW and global self-worth.

Adolescents are faced with physical, mental, psychological, and behavioral changes, which can affect their cognition, psychological well-being and behavior. Given such developmental changes, the gender effect on the association between PA and PSW can differ by age. In this regard, it is conceivable that the moderating effect of gender is not noticeable during early adolescence, but more salient during childhood or late adolescence. Future studies can examine the moderating effect of gender in a wide range of age groups.

Limitations and Directions for Future Research and Interventions

There are some limitations with this study. Participants were recruited from one public school in a metropolis and all of the participants were Korean middle school students. Therefore, generalization of the findings of the present study is limited. For a population with different ethnic backgrounds or environments, it may be that different factors influence the relationships among PA, PSW, and QoL. Therefore, future research that recruits a large sample from different schools (e.g., both private and public) in multiple cities (e.g., both urban and suburban) based on a systematic random sampling method may produce generalizable findings. Including diverse ethnic groups in one study can enable generalization of the findings.

Due to the nature of the cross-sectional study, causal relationships among PA, PSW and QoL cannot be inferred. Data on the self-report measurements were collected at a one-time point, which makes it impossible to establish a temporal relationship from this study. Although the temporal effects of PA cannot be determined in this study, several

longitudinal studies exist that suggest the longitudinal association between PA and QoL, mediated by PSW (Elavsky, 2009; Elavsky et al., 2005; Phillips et al., 2013). Future research should investigate the mediating effects of PSW on the association between PA and QoL from early adolescence to late adolescence. Also, investigations of reciprocal relationships among PA, PSW and QoL during adolescence may provide useful information. These future studies are particularly important in that adolescents' PA and QoL start to decline in early adolescence as they face multiple developmental changes (Bisegger et al., 2005; CDC, 2014; Korea CDC, 2017; Michel et al., 2009; Tremblay et al., 2014).

The present study used a self-report to collect data from participants. Using self-report has some weaknesses such as social desirability. However, in this study, efforts were made to reduce the disadvantages of using self-report measures. For example, participants were assured that the individual profile would not be used or shared with school employees. In addition, established measures were used to assess PA, PSW and QoL. All of these measures have demonstrated sound psychometric properties in multiple studies with adolescents. In particular, the physical self-worth scale (PSWS) has a two-step-based alternative format that is intended to minimize social desirability (Fox & Corbin, 1989). The PA measure was deemed the best measure to assess children and adolescents PA (Biddle et al., 2011). KIDSCREEN measures were developed through an extensive and rigorous survey development process and have been used internationally. All of the measures used in this study demonstrated high reliability.

Future investigations can include multiple mediators and moderators. Previous studies indicated that age and individual value systems may moderate the association between PA and QoL (McAuley & Morris, 2007; Netz et al., 2005; Oh et al., 2016). Additionally, the association between PA and PSW was moderated by age (Babic et al., 2014). Age may be a key factor that regulates the degree of the effect of PA on QoL. Identifying moderators is an important research endeavor that can provide a basis to increase effectiveness of PA intervention programs for particular target populations. Other potential mediating variables include fitness (Gu et al., 2016), body dissatisfaction (Finne et al., 2013), health status, and self-efficacy (McAuley et al., 2006, 2008). The relative strength of each mediating effect when controlling for other mediators in adolescents can be tested.

Lastly, Rejeski and Mihalko (2001) called for a more extensive model that explains the association between PA and QoL. A more comprehensive model can be established when including subdimensions of PSW and global self-esteem in addition to PA, PSW and QoL. One study involving PA, subdimensions of PSW, PSW, and global self-esteem demonstrated longitudinal relationships among these variables (McAuley et al., 2005). Future research can examine if the effect of PA on QoL works through a series of these mediating factors. Building a comprehensive model for the association between PA and QoL may clarify how these important variables interact with and relate to each other.

Development and implementation of evidence-based PA interventions is needed to prevent PA and QoL from steadily declining from early adolescence through advanced

adolescence. Several researchers (Gu et al., 2016; Iannotti et al., 2009a; McAuley & Morris, 2007) stressed the importance of designing PA interventions built upon current research evidence. McAuley and Morris (2007) suggested that the focus of PA interventions be on mediating variables that link PA to QoL. The current study clearly revealed that PSW was highly associated with QoL even after controlling for PA. Promotion of PSW regardless of PA is likely to lead to improvements in QoL. PE teachers and PA program instructors can help participants to feel proud, respected and confident physically by fostering a positive, supportive and non-judgmental learning environment.

Another key recommendation is that adolescents should be encouraged to adopt a physically active lifestyle inside and outside of school everyday, whether it is structured PA or informal PA. In this way, adolescents can forestall decreases in QoL in later years. The findings of this study showed that although girls and boys engaged in different types of PA, both girls and boys who performed regular PA perceived higher QoL through higher PSW. Given that both girls and boys reported walking as one of the most frequently practiced physical activities, being physically active throughout the day can maintain and even improve their QoL.

In addition, communications among researchers, educators, school administrators, policy makers, and PE teachers may be necessary. To date, none of the PA intervention programs that are intended to promote adolescents' QoL involved such communications. Cameron, Jolin, Walker, McDermott, and Gough (2001) pointed out the need for researchers and practitioners to collaborate to provide the best practices for health

promotion. As noted by Cameron et al. (2001), assessing effectiveness, plausibility and practicality of the program systematically may increase the likelihood of the successful implementation of school-based PA intervention programs. Such a collective endeavor may help create effective teaching strategies and curriculums incorporated in PA programs to enhance both PA and QoL for adolescents.

Conclusions

In closing, the findings of the current study extend the previous findings by examining the mediating role of PSW and moderating role of gender simultaneously. The findings confirm the importance of PSW in the relationship between PA and QoL in early adolescents. The current study is the first study that investigated PSW as a mediator on the relationship between PA and QoL in adolescents. This study clearly show that PA was positively associated with PSW, and then with QoL for both girls and boys.

Overall, the findings of this study add to our understanding of the relationships among PA, PSW and QoL in early adolescents. The findings of this study can be replicated in different age groups, especially children and older adolescents. Future research needs to further clarify the relationship between PA and QoL in children and adolescents by exploring a more comprehensive model with multiple mediators and moderators that influence the relationship between PA and QoL. Development, implementation and evaluation of evidenced-based PA intervention programs to improve both PA and QoL are highly warranted. Although the effect of PA on QoL worked through PSW for both genders, special attention should be given to tailor-made

interventions to improve girls' PA, PSW and QoL. Combined evidence from both research and practice can increase our understanding as to how we can collectively promote PA and ultimately QoL for youth**.**

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APPENDIX A

DEMOGRAPHIC QUESTIONNAIRE

Please provide/mark the appropriate answers that best describe YOUR demographic characteristics. Please answer all of the questions as honestly as possible.

1. Your gender
◯ Male
◯ Female

2. Your age:_____

3. What grade are you in?
◯ Middle school first grade
◯ Middle school second grade
◯ Middle school third grade

APPENDIX B

PACE+ ADOLESCENT PHYSICAL ACTIVITY MEASURE

Physical activity is any activity that increases your heart rate and makes you get out of breath some of the time.
Physical activity can be done in sports, playing with friends, or walking to school.
Some examples of **physical activity** are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football, and surfing.

Q1. Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?

○	○	○	○	○	○	○	○
0 days	1	2	3	4	5	6	7 days

Q2. Over a typical or usual week, on how many days are you physically active for a total of at least 60 minutes per day?

○	○	○	○	○	○	○	○
0 days	1	2	3	4	5	6	7 days

APPENDIX C

PHYSICAL ACTIVITY TYPES QUESTIONNAIRE

In what kind of physical activity do you regularly participate?
Please list below up to three physical activities you regularly do. If you don't participate in any physical activity, please write "none."
What physical activities do you participate most often? :_____

If you participate in any other physical activities, please list below up to two other physical activities.
_____ , _____

APPENDIX D

THE CHILDREN AND YOUTH PHYSICAL SELF WORTH SCALE

What am I like?
These are statements that allow people to describe their physical selves.
There are no right or wrong answers because people differ a lot.
First, decide which one of the statements best describe you.
Then, go to that side of the statement and check if it is just "sort of true" or really true" FOR YOU.

	Really True For Me	Sort of True For Me	EXAMPLE			Really True For Me	Sort of True For Me
	☐	☐	Some kids are competitive	BUT	Others are not competitive	☒	☐
			REMEMBER to check only ONE of the four boxes				
1.	☐	☐	Some kids are ***proud*** of themselves physically	BUT	Other kids don't have much to be proud of physically	☐	☐
2.	☐	☐	Some kids are ***happy*** with how they are and what they can do physically	BUT	Other kids are ***unhappy*** with how they are and what they can do physically	☐	☐
3.	☐	☐	Some kids ***don't*** feel very confident about themselves physically	BUT	Other kids feel really good about themselves physically	☐	☐
4.	☐	☐	Some kids have a positive feeling about themselves physically	BUT	Other kids feel somewhat negative about themselves physically	☐	☐
5.	☐	☐	Some kids wish that they could	BUT	Other kids ***always*** seem to	☐	☐

			feel better about themselves physically		feel good about themselves		
6.	☐	☐	Some kids are very ***satisfied*** with themselves physically	BUT	Other kids are often ***dissatisfied*** with themselves physically	☐	☐

APPENDIX E

KIDSCREEN-52 HEALTH QUESTIONNAIRE FOR CHILDREN AND YOUNG PEOPLE (PHYSICAL, PSYCHOLOGICAL AND EMOTIONAL)

Hello,
How are you? How do you feel? This is what we would like you to tell us.

Please read every question carefully. What answer comes to your mind first? Choose the box that fits your answer best and select it.

Remember: This is not a test so there are no wrong answers. It is important that you answer all the questions and also that we can see your marks clearly. When you think of your answer, please try to remember the last week.

You do not have to show your answers to anybody. Also, nobody who knows you will look at your questionnaire once you have finished it.

Physical Activities and Health

1. In general, how would you say your health is?

◯ excellent
◯ very good
◯ good
◯ fair
◯ poor

Thinking about the last week...

	not at all	slightly	moderately	very	extremely
2. Have you felt fit and well?	◯	◯	◯	◯	◯
3. Have you been physically active (e.g. running, climbing, biking)?	◯	◯	◯	◯	◯
4. Have you been able to run well?	◯	◯	◯	◯	◯

Thinking about the last week...

	not at all	slightly	moderately	very	extremely
5. Have you felt full of energy?	○	○	○	○	○

Feelings

Thinking about the last week...

	not at all	slightly	moderately	very	extremely
1. Has your life been enjoyable?	○	○	○	○	○
2. Have you felt pleased that you are alive?	○	○	○	○	○
3. Have you felt satisfied with your life?	○	○	○	○	○

Thinking about the last week...

	not at all	slightly	moderately	very	extremely
4. Have you been in a good mood?	○	○	○	○	○
5. Have you felt cheerful?	○	○	○	○	○
6. Have you had fun?	○	○	○	○	○

General Mood

Thinking about the last week...

	not at all	slightly	moderately	very	extremely
1. Have you felt that you do everything badly?	○	○	○	○	○
2. Have you felt sad?	○	○	○	○	○
3. Have you felt so bad that you didn't want to do anything?	○	○	○	○	○
4. Have you felt that everything in your life goes wrong?	○	○	○	○	○
5. Have you felt fed up?	○	○	○	○	○
6. Have you felt lonely?	○	○	○	○	○
7. Have you felt under pressure?	○	○	○	○	○

APPENDIX F

KIDSCREEN-10 HEALTH QUESTIONNAIRE FOR CHILDREN AND YOUNG PEOPLE

Thinking about the last week...

	not at all	slightly	moderately	very	extremely
1. Have you felt fit and well?	○	○	○	○	○
2. Have you felt full of energy?	○	○	○	○	○
3. Have you felt sad?	○	○	○	○	○
4. Have you felt lonely?	○	○	○	○	○
5. Have you had enough time for yourself?	○	○	○	○	○
6. Have you been able to do the things that you want to do in your free time?	○	○	○	○	○
7. Have your parent(s) treated you fairly?	○	○	○	○	○
8. Have you had fun with your friends?	○	○	○	○	○
9. Have you got on well at school?	○	○	○	○	○
10. Have you been able to pay attention?	○	○	○	○	○

APPENDIX G

SUMMARY OF MOST OFTEN PRACTICED PHYSICAL ACTIVITIES FOR BOYS

PA Types	Number	Percentage
Soccer	24	20.51%
Basketball	20	17.09%
Walking	14	11.97%
Bodyweight exercise	9	7.69%
Badminton	7	5.98%
Taekwondo	7	5.98%
Running	6	5.13%
Bicycling	6	5.13%
Jump rope	6	5.13%
Boxing	5	4.27%
Brisk walking	3	2.56%
Swimming	3	2.56%
Walking to school	2	1.71%
Play	1	0.85%
Stretching	1	0.85%
Baseball	1	0.85%
Kickboxing	1	0.85%
Dodgeball	1	0.85%

APPENDIX H

SUMMARY OF OTHER PHYSICAL ACTIVITIES FOR BOYS

PA Types	Number	Percentage
Running	25	16.23%
Basketball	23	14.94%
Bodyweight exercise	15	9.74%
Jump rope	12	7.79%
Soccer	10	6.49%
Bicycling	9	5.84%
Walking	8	5.19%
Badminton	8	5.19%
Volleyball	6	3.90%
Swimming	6	3.90%
Table tennis	6	3.90%
Dodge ball	6	3.90%
Baseball	4	2.60%
Jujutsu	3	1.95%
Tennis	3	1.95%
Boxing	2	1.30%
Skiing	2	1.30%
Play	1	0.65%
Brisk walking	1	0.65%
Breathing exercise	1	0.65%
Soccer tennis	1	0.65%
Pool	1	0.65%
Floorball	1	0.65%

APPENDIX I

SUMMARY OF MOST OFTEN PRACTICED PHYSICAL ACTIVITIES FOR GIRLS

PA Types	Number	Percentage
Walking	20	23.81%
Basketball	10	11.90%
Running	9	10.71%
Walking to school	9	10.71%
Dance	8	9.52%
Jump rope	7	8.33%
Badminton	4	4.76%
Indoor cycling	4	4.76%
Taekwondo	4	4.76%
Brisk walking	2	2.38%
Stretching	2	2.38%
Dodgeball	2	2.38%
Hiking	1	1.19%
Swimming	1	1.19%
Yoga	1	1.19%

APPENDIX J

SUMMARY OF OTHER PHYSICAL ACTIVITIES FOR GIRLS

PA Types	Number	Percentage
Running	17	16.50%
Jump rope	14	13.59%
Walking	11	10.68%
Basketball	9	8.74%
Badminton	8	7.77%
Dance	7	6.80%
Dodgeball	6	5.83%
Swimming	6	5.83%
Stretching	5	4.85%
Brisk walking	2	1.94%
Taekwondo	2	1.94%
Walking to school	1	0.97%
Bodyweight exercise	1	0.97%
Skating	1	0.97%
Yoga	1	0.97%
Rollerblade	1	0.97%
Volleyball	1	0.97%
Bowling	1	0.97%
Breathing exercise	1	0.97%
Indoor cycling	1	0.97%
Bicycling	1	0.97%
Gymnastics	1	0.97%
Soccer	1	0.97%
Table tennis	1	0.97%
Tennis	1	0.97%

Pilates	1	0.97%
Hula-Hoop	1	0.97%